THE METAL INDUSTRY

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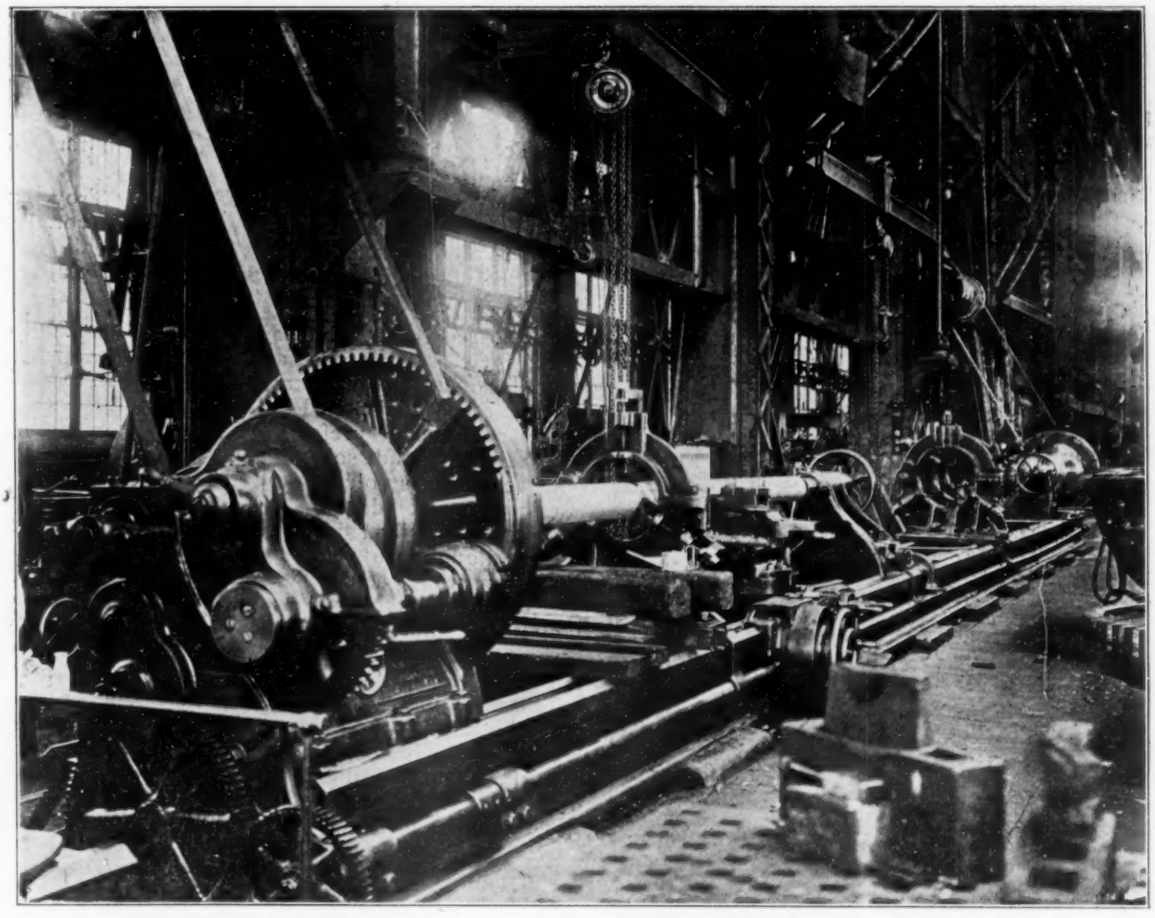
TURNING PARSONS' NO. 1-A MANGANESE BRONZE ROD VALVE STEMS.

SOME INFORMATION REGARDING THE MANGANESE BRONZE FORGED RODS FOR THE NEW YORK WATER SUPPLY SYSTEM.

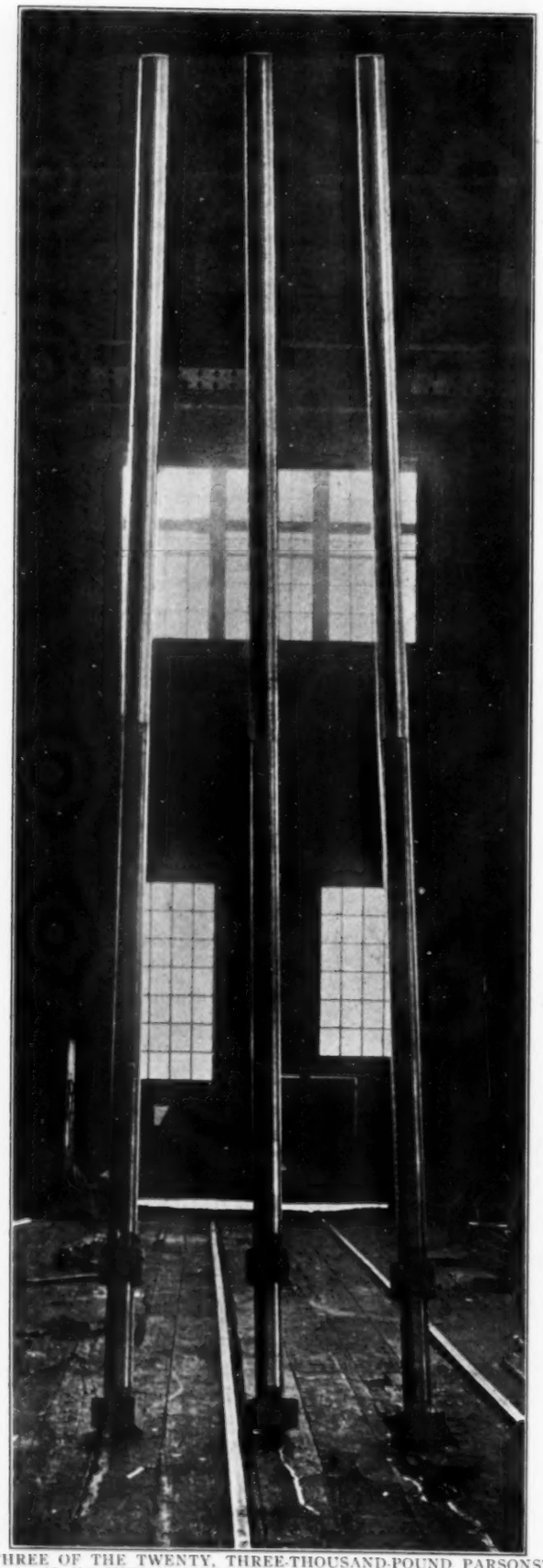
The March, 1911, number of THE METAL INDUSTRY contained an account of the forging of twenty manganese bronze rods to be furnished the New York City Board of Water Works for the Ashokan water supply system by the William Cramp & Sons Ship and Engine Building Company, Philadelphia, Pa. These rods were made out of the mixture known as Parsons' No. 1-A Manganese Bronze, the sole rights of which for the United States are held by the Cramp Company. The rods were forged from a solid billet weighing upwards of six thousands pounds and measuring seven feet long, with a diameter of sixteen inches at one end and thirteen at the other. Some of the physical features of the metal are shown in the following table:—

	Billets.	Forgings.
Tensile strength	69,500 lbs.	75,000 lbs.
Elastic limit	30,550 lbs.	37,500 lbs.
Elongation in 2 inches..	42.5 per cent.	37.5 per cent.
Reduction in area.....	40.0 per cent.	36.0 per cent.



THE FIFTY FOOT LATHE ON WHICH THE SEVENTEEN FOOT SIX-INCH THREAD WAS CUT ON THE THREE THOUSAND POUND PARSONS' A-1 MANGANESE BRONZE FORGED VALVE STEM.

It will be noted that the tensile strength per square inch of the forging is much higher than that of the billet. It has been proposed to cast these rods as stems



THREE OF THE TWENTY, THREE-THOUSAND-POUND PARSONS' A-1 MANGANESE BRONZE FORGED VALVE STEMS FOR THE NEW YORK WATER SUPPLY SYSTEM.

and use them without forging. It is difficult to see how rods made in this way would have the ultimate strength to withstand the required strain.

After the rods were forged they were taken from the forge shop to the machine room and one by one were placed upon the lathe, shown in fig. 1, and turned off the entire length, one-half inch in depth. An Acme 29 deg. thread with a half-inch pitch was then cut on each rod for seventeen feet six inches long. A round collar six inches thick was then placed on the rod four feet from the end and a square cap nut was keyed on the extreme end. The lathe on which the rods were turned is an imported machine, fifty feet in length between centres. The man in charge of the turning and thread cutting does not consider that it was much of a job to handle inasmuch as he has turned off steel shafts larger in diameter and fifty feet in length.

The weight of the finished rod as shown in Fig. 2, is around 3,000 pounds, so that by referring to our original figures we find a shrinkage of nearly one-half, all of which goes to make for a remarkably sound and strong rod. At the present time seventeen out of the twenty rods have started for their destination and we hope in the near future to show some of them at least in their final position, where they will stand guard over the precious water supply of a great city. As told in our last article, four of the monster rods go to the Ashokan dam, eleven to the effluent and five to the influent chamber of the Hill View Reservoir.

FORMULA FOR SILVER PLATING BATH.

To prepare a sixty-gallon silver bath for ordinary work, use the following proportions:

Fine silver, 999/1000 fine.....120 Troy ozs.
Cyanide of Potassium..... 22 Avor. lbs.
Water ..... 60 gallons.
Bisulphide of carbon (dissolved in sulphuric ether, ½ oz. carbon to 4 ozs. ether).

To prepare the silver as a chloride, mix 240 ozs. of commercial nitric acid and 240 ozs. of warm water, and add 120 ozs. of metallic silver slowly to avoid too great a heat, developed by the action of the acid. The silver should be preferably cut up into strips. After the silver is all dissolved in the form of the nitrate, add three times its volume of cold water. Now take muriatic acid and add slowly as long as a precipitate of chloride of silver is obtained; then syphon off the clear liquid into another receptacle and add a little more muriatic acid to it to determine if there is any more silver in solution; if not, throw away. The precipitated chloride of silver obtained should be washed thoroughly at least six times with clean cold water, allowing the precipitate to settle thoroughly each time. Test with blue litmus paper until the paper is no longer turned red in the slightest degree.

Now dissolve the cyanide of potassium in about thirty gallons of water; then add the silver chloride, and when all dissolved, add the balance of the water. After the solution has stood for a number of hours, or over night, add the bisulphide of carbon. It may be necessary to add a little more free cyanide of potassium, probably one-half ounce to each gallon. But it is far better to have too little cyanide in a new solution than too much. This will give a good solution, the content of which can be increased up to four or five ounces of silver per gallon if required, using the requisite amount of cyanide in connection with the increased amount of silver, but for ordinary work two ounces of metallic silver per gallon gives good results.

GALVANIZING WIRE IN ZINC DUST.*

By Alfred Sang.

Ever since I presented before the American Electrochemical Society my first paper on galvanizing steel wire by heating it electrically in zinc oxide or zinc dust, I have realized that a perfectly clear conception of the forces at work was essential for successfully operating the process. Once the nature of zinc dust was well understood and the action which different temperatures may have on it was clearly demonstrated, the application of the process was found to be, after all, not nearly as complicated as might have been feared, in fact it was less complicated than the other two processes in general use.

It must be recalled that zinc dust does not melt when heated to the temperature of fusion of zinc, but at higher temperatures reducing agents will "precipitate" the metal, as it were, and it can also be squeezed out under mechanical pressure. This property of resisting fusion is supposed and is probably due to the surface of each particle being formed of zinc oxide or zinc carbonate.

If zinc dust is heated evenly, the temperature is found to rise steadily until around 390 degs. C. when the rise becomes much more rapid, attaining its maximum rate at about 420 degs., then falling gradually until in the neighborhood of 470 degs. it again becomes normal. When the dust is cooled down an opposite effect is noted between 450 degs. and 260 degs. If the operations of alternately heating and cooling the same dust are repeated, the exothermic and endothermic effects are manifested each time between the same temperatures, with their apices at about 420 degs. on the rise and about 350 degs. on the fall.

We cannot help but notice that the exothermic effect on the rise occurs at the melting point of zinc metal, but when zinc is melted the effect is the very reverse, heat being absorbed at the moment of fusion to the extent of 28 Calories per kilogram.

We are therefore in presence of an anomalous critical point, and I will now consider separately the operations of galvanizing in zinc dust below and above that critical point.

If a clean piece of steel wire is immersed in zinc dust which is heated to a temperature below 420 degs., or at what is known as "sherardizing temperatures," a slow cementation takes place and zinc is absorbed from the very moment that the wire reaches the temperature of the dust; there is at the same time a slow sublimation of zinc at the surface increasing with time but sufficient for all practical purposes after a few hours of treatment; in the presence of reducing gases the time of treatment can be considerably lessened but the penetration of zinc is, of course, less. This process is sherardizing, unsurpassed for many purposes, unsuitable for many others. There are two varieties of sherardized coatings: the gray, porous and brittle variety, mostly composed of zinc carbonate which darkens with age; other variety has a high metallic luster and is compact and of a finely crystalline structure. If this were the class of sherardizing produced by all existing plants, there would not be much hot-galvanized work produced outside of wire and sheets.

When we work with the dust at a temperature above the critical 420 degs., results are entirely different; galvanizing is *instantaneous*, taking place the very instant that the wire reaches the temperature of the dust. There is very little penetration of zinc in the iron; there may be vaporization and condensation of zinc as in sherardizing, although I doubt it. A wire heated to 800 or 900 degs. in a non-oxidizing flame and quickly thrust into cold zinc dust will condense around itself a considerable thickness of zinc. The best working temperature ranges between 500 and 600 degs. C. The galvanizing is bright and more pleasing in appearance than that obtained by any other means.

I will not go into details of the furnace used, which merely consists of a zinc-dust trough between two sand troughs provided with a set of cast-iron cover-plates over the zinc trough and power-driven rolls. As high a speed as 850 ft. per minute can be used for securing good merchant galvanizing. It is found preferable to run at 35 ft. only, running a large number of strands and attaching the coils end to end.

The process is economical as regards current consumption which, outside of zinc and labor with a very small amount of power for driving the rolls, represents the bulk of direct cost. Figures are readily arrived at, for as soon as the dust has attained a fairly constant temperature, as it very rapidly does, the consumption of electricity in watt-hours is represented by the formula

$$\text{Watt-hours} = \frac{w \times s \times t \times 7}{6}$$

where

w = weight of wire treated....say 1,000 kilograms.
s = specific heat of steel.....say 0.18 at 550 degs.
t = temperature to be maintained .....say 550 degs. C.
w s t = calories needed, which, multiplied by the ratio 7/6, gives the watt-hours.

Figuring 75 per cent. efficiency for the dynamo or transformer supplying the current, the above formula gives 154 kilowatt-hours per long ton of wire of any diameter.

While the wire is softened by the process, a full annealing can only be secured by using a higher temperature, the consumption of electrical energy being then increased from 40 to 50 per cent. and the sand trough through which the wire passes after leaving the zinc dust must be appreciably lengthened. If a slight scale is to be removed, the high temperature must be used in connection with a reducing agent. Sand must be used with the zinc dust to prevent caking and cavitation in the path of the wire. Aluminum contact rolls and special mercury contacts are the only ones suitable for this kind of plant.

The wire can be brought out into the air immediately after coating, but it is preferable to let it cool by passing it through sand which brightens it at the same time.

The instantaneous galvanizing of steel in zinc dust above 420 degs. is readily explained by completing the theory which I developed as far back as 1907; I will now state it in its complete form.

Zinc dust is produced by the sudden cooling of the vapor of zinc and the transition from the gaseous to the solid state is so rapid that, for all practical pur-

*Paper read at the Twentieth General Meeting of the American Electrochemical Society, in Toronto, Canada, September 21-23, 1911.

poses, the liquid state is skipped. The setting of the zinc, brought about by sudden chilling, prevents regular arrangement of the molecules along determined stereochemical lines; it forbids the formation of crystals for which time is required. The heat of solution of matter in an amorphous state is always higher than when in a crystalline state; the same is true of a strained condition which likewise presents an amorphous appearance. At the time of formation, considerable heat is retained which would have been radiated by slow cooling. The condition is one of physical instability resulting in readier and, oftentimes, explosive decomposition.

The physical instability of zinc dust may be explained thus: in the prolongs of zinc furnaces the uncondensed vapor is suddenly chilled and collects in minute drops which are instantly congealed at the surface and oxidized, forming a rigid spherical skin or crust. Within this crust the liquid zinc cools and contracts more slowly but the rigidity of the crust does not permit the drawing in of the surface to form the facets of a crystal and compensate this internal contraction. Thus, voids must exist within the crust and we may presume a structure which might be described as "piped radially" or as negatively crystalline.

Below the melting point of zinc this condition persists but affinities and thermal inducements find a readier response from zinc dust than from any other form of zinc, both by reason of the enormous amount of free surface and because of this unstable condition. At about 415 degs., which is the melting point of zinc, the strain within the zinc dust particle is totally or almost totally relieved as indicated by the loss of heat, although some of the latent heat must be retained for fusion. At high temperatures zinc dust is pasty, because formed of innumerable little bags of melted zinc, but these will not coalesce on account of their small size and closely packed condition, unless considerable pressure is used. These minute bladders might be compared to soft-shell turtle's eggs; they form a plastic and cellular mass.

If, however, a reducing agent, say a drop of coal tar, is introduced, reduction of the skin takes place and we get a small mass of more or less spongy metallic zinc. If a metal which is electronegative to zinc, such as iron, is put into contact with these bags of zinc, reduction and an exchange of metals take place, the bag is punctured at the point of contact and the zinc spreads itself on the iron. Hence it is that wire can be galvanized in this manner by means of a plant closely resembling a hot galvanizing plant, for the process is, in fact, one of hot galvanizing.

THE FALLACY OF THE BAUMÉ SCALE.

AN EXPLANATION OF HOW IT FAILS WHEN USED TO DETERMINE THE METALLIC CONTENT OF THE PLATING BATH.

BY CHARLES H. PROCTOR.

In these days of modern progress in the art of electro-deposition it is surprising how much reliance is placed upon the Baumé scale or hydrometer by the plater. It is true that the hydrometer will give you the degree of density of the solution, but what does that amount to in a bath that has been used constantly for a length of time—anything that is soluble in water will add to its density. In a like manner any substance that is added to a solution that is soluble will also add to its density whether it be cyanide or acid. How often, in the years that I have been answering questions, has come the same old story, "my solution stands so and so Baumé," and the inquirer would have himself believe that because the solution stood at a certain degree of density, according to his ideas, it should surely work correctly, and he wonders why he does not get results.

It is true that in preparing a new solution from known quantities the Baumé hydrometer is very useful because it enables the operator to determine the degree of density which, in his opinion, will give the best results. If he is a practical man and understands the proper proportions, after the solution is once prepared, he will have but little need for the Baumé hydrometer. Unfortunately very many platers do not make a practical study of the proper degree of density of the various solutions which should at all times enable them to produce the very best results, all things being equal. So frequently such questions as these come along: "My solution plates dull and produces stains; it stands at 7 degs Baumé." "My brass solution works reddish. I have added zinc and still it works reddish; it stands at 12 degs. Baumé." "I have a silver solution which, until recently, worked all right. My current strength is all right but I do not get a good deposit; my solution stands 15 degs. Baumé." And just because the density appears to them to be correct and the current strength the same as previously used, everything should be satisfactory and there should be no further difficulty and so hundreds of questions come along in the same manner.

In giving a satisfactory answer to these questions I ignored the density. In the first instance the nickel solution was too concentrated; in the second the solution required copper instead of zinc; and in the third the silver solution was too low in metal in proportion to the cyanide. Thus it can readily be seen that the idea of relying upon the Baumé scale in such cases was entirely false. A nickel solution may contain nothing but ammonia salts with very little metal and still reach the proper degree of density, and according to the idea of the operator should give results; and in like manner the cyanide and acid solutions should, according to some platers ideas, work satisfactorily because they register the proper degree of density upon this much valued scale.

The time is coming when the plater will relegate the Baumé method to the background as he becomes more proficient in chemistry and electro-metallurgy, which he will have to more thoroughly understand in the near future. He will then be able to determine by the exact science of atomic and molecular weights the true cause of the troubles he has inherited, because he willingly allowed the true and unfailing science of chemistry to lie dormant, when it should have been the very foundation of his success upon which the art of plating should be built as was intended by the very men who were masters of the art. When this time comes the fallacy of using the Baumé scale as a solution of the platers troubles will be realized.

CLOISONNÉ ENAMELLING.

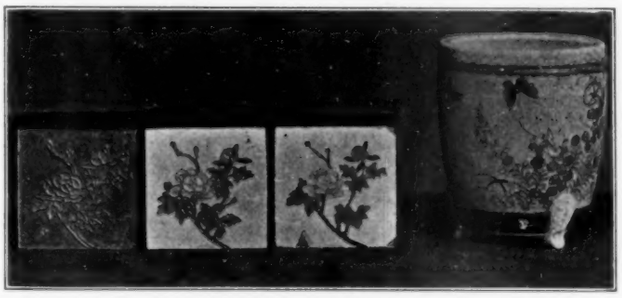
By R. I. Geare.*

The application of enamel to metal (or porcelain) is usually accomplished by the "cloisonné" or the "champlevé" process. The latter is an East Indian method, by means of which the design is hollowed out of a plate or metal prepared for the reception of the enamel so as to leave the cells separated from each other by narrow strips of the body of the object. There are other methods, too, such as *basse-taille*, which is practically a chasing in low relief floated over other objects of Roman workmanship. The art of cloisonné enamelling probably originated, however, in Asia—perhaps in Persia or India.

Pure enamel is a colorless compound of silex and oxide of lead; or of silica, litharge and nitre, with white lead or silex powder added, in order to give the mass fusibility. The colors are furnished by a variety of oxides; *e. g.*, the oxide of tin makes an opaque, white enamel, and if manganese be added, the white becomes

THE FIRST TWO ARTICLES ARE EXAMPLES OF CLOISONNE ENAMELLING ON METAL WARE, WHILE THE THIRD SHOWS CHAMPLEVE WORK.

with a colored glaze, and the "painted enamel" process, which is painting in enamel colors on a surface of glass fused to copper and passed through the kiln, like pottery. Probably the oldest of all these methods is the cloisonné, and many beautiful specimens of en-



FIGS. 1, 2 AND 3, ILLUSTRATING THE PRINCIPAL STAGES IN THE PROCESS OF CLOISONNE ENAMELLING. FIG. 4, CLOISONNE ENAMELLING ON PORCELAIN.

ameled jewelry are in the collections of the great museums of Berlin and Munich. These specimens were found at Meroe, 800 miles south of Egypt, with

*United States National Museum, Washington, D. C.

clear and brilliant. Blue is produced from the oxide of cobalt; green, from the oxide of copper; violet, from the black calx of manganese; yellow, from silver; purple, from gold; and red, from the sulphates of iron and alumina. Briefly, the process of applying enamel is as follows: The body of the object is first ground, to remove any glaze and to insure the enamel adhering firmly. Next, a drawing on paper of the design to be applied is covered with a plate of glass, on the surface of which is bent a fine, narrow brass ribbon or flat wire, following closely the outlines of the drawings. Thus every leaf, or whatever the design may consist of, is outlined and becomes a cell ("cloison"). The edge of the wire is then applied to the surface of the object to be enameled and fixed by means of a fusible glass.

The wire now being fastened on, the enamels, in the form of a paste, are transferred to fill up all the cells, the proper colors, of course, being used as indicated on the original design. After the enamels are melted by baking they settle down in the cells and the paste is renewed as often as necessary to give the proper thickness, and the process of firing is repeated between each addition of the paste. Finally, the rough surface is ground with coarse stones, next with finer stones, and lastly with charcoal. This completes the process and the object is ready for the market.

PATENT CONTROVERSY OVER BEARING METALS.

THE CONTINUATION OF AN INTERESTING DISCUSSION WHICH WAS STARTED BY THE READING OF A PAPER AT THE CINCINNATI CONVENTION OF THE BRASS FOUNDERS' ASSOCIATION, MAY, 1909, TWELFTH PAPER.

BY G. H. CLAMER.*

This discussion in connection with copper-tin-lead alloys has now been so long drawn out, that I am afraid it is becoming tiresome to the readers of THE METAL INDUSTRY. For this reason, I will reply to Mr. Allan's July discussion in as concise a manner as possible. Mr. Allan has not properly stated the fact in connection with admissions which I have made, concerning those alloys of copper-tin-lead which it is not possible to make by ordinary foundry practice, i. e., alloys outside of those made in accordance with the teaching of Letters Patent 12,880. The statements which I have made are as follows:—

1. Sulphur prevents the segregation of lead in copper-tin-lead alloys in which the tin is in excess of nine per cent. tin to ninety-one per cent. copper, and in which the lead is well above twenty per cent.

2. That it is not possible, by resorting only to ordinary foundry practice to produce alloys at the higher end of the curve shown in Mr. Allan's diagram, Fig. 1, whereas, there is no difficulty whatever in producing these at the lower end of the diagram, i. e., those shown in my own

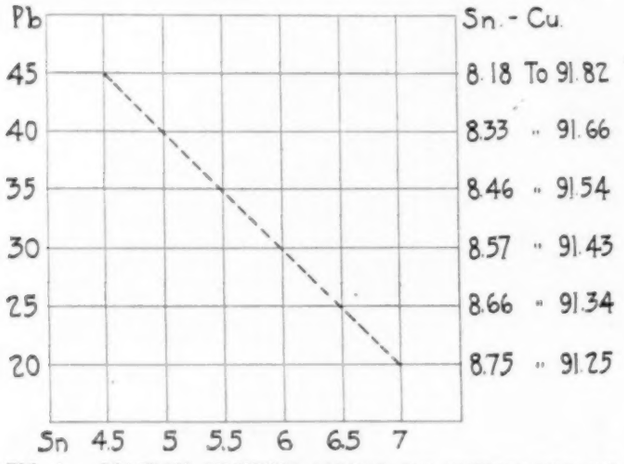


FIG. 1. DIAGRAM SHOWING ALLOYS (AT HIGHER END OF CURVE) THAT ARE NOT POSSIBLE TO PRODUCE BY ORDINARY FOUNDRY PRACTICE.

diagram No. 2, in which the curve represents the maximum amount of lead which can be incorporated with each corresponding percentage of tin.

3. Sulphur is not necessary for the production of those alloys made in accordance with the proper interpretation of Patent No. 12,880, viz:—those shown in my own diagram, No. 2.

Mr. Allan has heretofore been unwilling to admit that sulphur and the "Allan" process is one and the same thing, or that sulphur, at least, is the essential element in the process. This he now agrees to, and I desire to say the field is entirely open to the general public to make all the alloys which are outside of the teaching of our Plastic Bronze Patent, i. e., those alloys which cannot be made by the simple operation of melting the three constituent metals in proper proportions, which after being cast, will show no segregation of metallic lead. It will probably be remembered by my readers that this discussion arose through a paper which the writer presented before the American Foundrymen's Association in May, 1909, in which the patent situation in respect to Plastic Bronze was clearly defined. Mr. Allan taking up the discussion in the hopes of convincing his readers that his father was the actual inventor of this class of alloys. The situation regarding the commercial production of these alloys to the best of my knowledge, is as follows:—

Mr. Allan put on the market, probably about 1891, a copper-lead alloy for lining and packing purposes. This alloy contained no tin whatever, and was marketed in a more or less limited way up to 1900. In 1900, our Plastic Bronze alloy containing tin with a high percentage of lead, was introduced for solid bearings, and the merits of the metal were instantly recognized. As a result of tests made by some of the largest consumers in the country, this metal was adopted and large tonnage followed. The success of this bronze led other manufacturers to imitate it, and although the writer has at all times been in very close touch with the various alloys on the market, our salesmen being in constant contact with the trade in all parts of the country, and our Laboratory being at their disposal, it was not until after my paper before the Foundrymen's Convention in May, 1909, that we heard of the Allan Company producing copper-tin-lead alloys. In fact the following statement by Mr. Allan, in his discussion of this subject in the July, 1909, issue of THE METAL INDUSTRY, as well as his literature on the subject previous to that time, clearly proves that no tin had been used prior to that time. Referring to his father's copper-lead alloys he states the following:

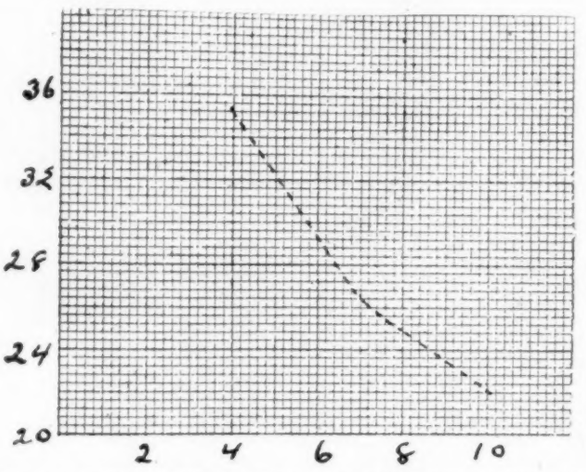


FIG. 2. CURVE REPRESENTING THE MAXIMUM AMOUNT OF LEAD THAT CAN BE INCORPORATED WITH EACH CORRESPONDING PERCENTAGE OF TIN.

"He learned from experience that tin, nickel or other metals added to the copper-lead mixture were quite injurious to the anti-friction and wearing qualities of the lead, and without raising the melting point, rendered the mixture hard and brittle, and not adapted for high grade service, such as facing locomotive, marine and stationary engines, steam pistons, piston rod packings for heavy service, bearings for mill pinions, rolling mill and central station engines, etc., tin especially because of its adhesive qualities, he found to be a very undesirable element in these alloys, when high grade anti-friction metal was wanted."

Now we find Mr. Allan advertising extensively copper-tin-lead alloys as the standard of excellence for bearings,

*Second Vice-President and Secretary, Ajax Metal Company, Philadelphia, Pa.

even going to the extreme of using higher tin than is contained in standard Plastic Bronze. Such a situation as outlined above, is inconsistent to say the least. Mr. Allan takes the stand, and has endeavored in this discussion to persuade his readers that because of his prior production of lead-copper alloy, that his father was the original inventor of copper-tin-lead alloy, such as Plastic Bronze. In reply to my statement in previous discussion that it has been pointed out that copper-lead and copper-tin-lead alloys are just as different in their properties as any other binary or ternary alloys, he replies as follows:—

"It is a question of degree of difference for the amount of tin determines the hardness of the copper rich matrix."

In other words, he contends that sugar and water are the same as coffee. Sugar and water is a solution of one constituent in another, whereas, the addition of a very small percentage of a third constituent, i. e., coffee, according to his contention, does not alter the sugar and water, except in degree. It is true that it is a change of degree, adding successively increasing amounts of coffee, but I contend that the addition of a minute amount of tin to the lead-copper alloy, is a radical difference in kind, just the same as adding a little coffee to the sugar and water. The further addition of tin, so long as no radical difference in property takes place, is a difference in degree only.

Although this fact, i. e., that copper-tin and lead present a radical difference in kind, was decided by two Courts, Mr. Allan says:—

"I am not basing my argument upon court's decision, but upon scientific knowledge."

Assuming the correctness of my judgment and the Court's judgment, that copper and lead, and copper-tin and lead alloys present radical differences in kind, as I have pointed out to Mr. Allan previously in this discussion, to prove prior use, it is now incumbent upon him, to present proof beyond reasonable doubt, that he produced in, a commercial way, alloys of copper, tin and lead, containing less than seven per cent. tin and more than twenty per cent. lead, balance copper, prior to 1898. He has evaded answering this question on two occasions, and still evades it a third time. In his last discussion, his answer being as follows:—

"I have absolute confidence in my ability to prove, beyond reasonable doubt, that A. Allan, Sr., invented the art of alloying lead and copper without and with tin; that the critical relation between tin and copper required to make possible high percentage of lead has not been established; that claims made in Letters Patent 12,880, are inoperative. Mr. Clamer concedes this by his diagram No. 2, published in connection with his March paper."

My readers will please note, this is not a reply to the question, which should be simply yes or no, whether he had produced, prior to 1898, alloys within the percentages specified. I am not asking for a legal opinion as to the validity of the patent, or his interpretation of it. Continuing the discussion, Mr. Allan quotes me as follows:—

"The difficulty which we overcame was not alloying lead and copper, but alloying lead and copper in the presence of tin."

and quotes from re-issued Letters Patent 12,880 as follows:

"To make our improved alloys, the copper is heated and melted until it is thoroughly liquid, the tin and lead are then added in proportion of under 7 per cent. by weight of tin, and not less than 20 per cent. by weight of lead, and the alloy then cast in suitable molds.'

This is the process invented and on which patent rights are claimed, i. e., that in order to incorporate a certain high percentage of lead, it is necessary to restrict the percentage of tin, when ordinary foundry practice is followed, and I cannot understand why Mr. Allan, as he has evidently been doing a lot of experimenting along this line, will not admit this fact, as he certainly must be conversant with it, if he just once attempted to produce the alloy. The patent teaches this clearly, and the limit set forth in the patent of 7 per cent. tin and 20 per cent. lead is a perfectly safe working limit, even although small percentages of impurities be present.

The patent teaches that the per cent. of tin must be decreased as the lead is increased, and it is for this reason that I am unable to produce by ordinary foundry practice, the alloys specified by Mr. Allen, i. e., 59.50% copper, 35% lead and 5.50% tin, also 55% copper, 40% lead and 5% tin. In these alloys, the percent. of tin is so high that it segregates the lead; by reducing the tin, the lead will not segregate. This is the fundamental fact which has been patented, i. e., that the proportion of the tin to copper must be decreased as lead is increased. Mr. Allen would endeavor to have his readers agree with his interpretation, i. e., that the patent means any amount of tin less than 9% to 91% copper in the mix, and maximum of 20% lead. He overlooks the fact that the patent clearly states that *the matrix holds up all the lead,* which means the tin must be so regulated that there is no lead segregation. Whether the scientific explanation or the theory presented, is a correct one is immaterial. An inventor, as I have stated before, is not required by law to state a theory correctly, a patent covers facts. The theory is the best one which has yet been presented to account for the peculiar behavior which tin manifests, i. e., the property of segregating lead if present in too high a proportion for any particular percentage of tin. For each percent. of tin present, there is a corresponding percentage of lead which can be held in the matrix. The maximum amount of lead for each corresponding percentage of tin, is given in my Diagram No. 2.

In the May, 1909 number, I made the following statement:

"I am quite well satisfied that the statements made by Mr. Allan in this discussion, which has appeared in this paper, also his circular covering Mr. Allan's Metal, have not been made with any attempt at deception, but are entirely in accordance with his own understanding of the facts, which, however, as I have pointed out, are not scientifically correct."

Mr. Allan, I regret to say, has not been so charitable, and although criticising me for sarcasm, has immediately proceeded to accuse me of deception, by intimating that our alloys, notwithstanding the fact that I have repeatedly claimed that they are made by simple every day foundry practice, are in reality produced by means of sulphur. He bases his intimation upon the fact that he purchased some Plastic Bronze on the open market, which happened to contain some sulphur. I have no knowledge of where Mr. Allan obtained this Plastic Bronze, whether it actually was Plastic Bronze, or any information in connection with it, but I desire to be placed on record as emphatically denying the intentional addition of sulphur to any of our copper-tin-lead alloys. No sulphur is necessary for all the alloys within the limits of my diagram No. 2, and any one who cares to prove this fact, can do so by simply melting in a crucible the metals in proportions as therein given. I take pleasure in sending to the office of THE METAL INDUSTRY, in accordance with Mr. Allan's suggestions in his

article in the July issue of THE METAL INDUSTRY, several ingots of the following compositions:—

1.—Copper, 50%. Lead, 50%.
2.—Copper, 65%. Lead, 30%. Tin, 5%.
3.—Copper, 67%. Lead, 24%. Tin, 9%.

I am sending also an ingot containing 50 per cent. lead and 50 per cent. copper, containing sulphur, which shows a better mixture than same composition made without it.

Analysis of these ingots will show they contain no sulphur, or at most the usual traces which are present in raw materials, or taken up from fuel in such amount only as would be present by using the very best of raw materials and crucible melting.

THE EQUIPMENT AND ARRANGEMENT OF MINTS IN ENGLAND

By "FANDORWALL."

(Concluded from September.)

ACCOUNTING FOR THE METAL.

The gold and silver coins are subjected to a final assaying after they have been examined and weighed—a coin is taken out of each batch and if found to be correct a certificate will be given to that effect by the assayer.

Each department has its clerk (who is responsible to the chief clerk of the mint), who keeps an account of all that comes in and goes out, and also keeps an account of all scrap, sweepings, and in the melting shop of the recovery of metal from the crucibles, furnaces, etc. The scrap generally amounts to 25 or 30 per cent., which, of course, is not lost, but remelted. We have finished with the actual coining of money and have now to deal with the production of the dies

FIG. 2. SECTION OF COIN DESIGN IN RELIEF.

for stamping the coins, which, in one sense, is more important than the production of the coin, because there can be no coins without dies, which must be perfect, and they require the utmost care at every stage in the making. The beauty of the coin depends largely on the work put into the dies.

THE MAKING OF THE DIES.

Space will not allow a history to be given of the development from the early rude hand punch to the present die designed for use in modern presses. This article has nothing to do with the design on each side of the coin further than engraving a copy on two steel dies, which are called matrices or master dies, one for each side of the coin. The dies may be engraved by an engraving machine, or they may be engraved by hand—the former is the quicker method. The design on each side of the coin stands up from the ground or plane on which it is formed; it is in relief (Fig. 2), so that it is necessary to cut the design into the master die, the reverse of the coin, the design is then in intaglio (Fig. 3.. The master die is a matrix or mold in which a punch is molded by pressure, and the punch so formed is used for making the working dies to be used on the coining presses, with the design in intaglio. There will therefore be (1) the master die or matrix with the design in intaglio; (2) the punch with the design in relief, for making the working dies; (3) the working die made from the punch, the design being in intaglio. The master die only being used for making the punch will last a long time—the punch for making the working dies will last a shorter period, probably being used a dozen times when it will fail. If the coins were made from an improved die instead of one made from a punch, a large staff of engravers would be kept busy engraving working dies, and there would also be slight differences in the design. This alone is sufficient reason for making the working dies with punches made or molded in the same master die.

FIG. 3. MASTER DIE INSECTION DESIGN IN INTAGLIO.

The steel used for the dies is of a very special nature and the proper temper has only been obtained after many experiments made by steel makers in conjunction with die makers. No. 12 on the plan (Fig. 1) is the die making shop, a portion of which is partitioned off on the side next to the yard on account of the light, for the engravers to work in. The die making plant consists of two die turning lathes, one die polishing lathe, one grindstone, one smith's hearth, two furnaces for hardening and annealing dies, ad a powerful hand screw press for die sinking, which is placed on a very solid foundation. The lathes are placed against the wall opposite to the doorway, and the grindstone under the line shaft. Over the lathes are three rolled joists, one end of each secured to the roof principals and the other end fixed in the wall; these joists carry the short line shaft and the counter shafts, the line shaft being driven by a motor placed upon two small joists secured to the joists carrying the line shaft.

MAKING THE PUNCHES.

Two engraved dies or matrices having been executed by the engravers from the design prepared for each side of the coin, they are carefully hardened, and the "temper" slightly drawn. The die maker having been furnished with these improved matrices, he proceeds to make punches from them, which will be in relief in the following manner, using the die press for pressing the punch into the matrix:

(1) A forged blank of special steel carefully annealed is turned to a cone and highly polished to remove all turning marks or scratches; this is the punch.

(2) The punch is put into the die press and the matrix is so placed on the press bed that the point on the coned end of the punch will come down exactly in the center of the matrix. When both punch and matrix are firmly fixed in their respective positions the punch is brought down on to the matrix with all the force the die maker can put into the press, giving the punch a blow which flattens the point of the cone, and at the same time impressing a portion of the design upon the punch.

(3) The punch is then taken out of the press and *carefully* annealed in a muffle, so that the air does not

get to it while it is hot, and thus prevents scale forming on the flattened cone end. When the punch is cold it is put into the lathe, being held in a special chuck, and the burr which has been formed by the squeezing action of the press is turned or trimmed off.

(4) The punch is again placed in the press exactly in the same position as before and a second blow is given which further flattens it and increases the area of the impression. The punch is again annealed and trimmed in the lathe and further blows given to it in the press, trimming and annealing after each blow until the whole impression of the design has been given to the punch, when it is put into the lathe and turned to the finished size and shape, then hardened and tempered. The die is ground to take away any slight distortion in the body produced in the hardening process, and, finally, the face which has received the design, is well buffed to make it clean, bright and smooth. The punch is now ready for making the working dies, the operations being the same as for making the punch, the die maker exercising the greatest care on every operation; nothing must be done hurriedly.

The best and quickest method for engraving the matrix or master die, is to employ an engraving machine, which entirely alters the ordinary routine in the engraving room. The engraving machine will reproduce any design placed upon the copying table, which is below the cutting tool. The cutting tool is a small end mill called a "quill," and rotates at a very high speed. The movements of this tool over the surface upon which the design is to be cut are controlled by reducing mechanism, having the same ratio as the copy has to the required design. The system or process of machine engraving is as follows:

(1) A large wax model is made of each design on the coin by the artist. The model is in relief, and may be six to eight times the size of the coin—this ratio is governed by the engraving machine.

(2) The wax model is heavily electrotyped and used for a pattern in the engraving machine.

(3) The long leg of the reducing mechanism traverses the whole pattern or design, giving a similar motion to the cutting tool in a less degree. The whole surface of the pattern is not traversed at once—a small area first, gradually increasing until the whole has been covered. As the area is increased so is the depth of the area on the matrix increased.

(4) When the engraving is finished the matrix is overlooked, and, if necessary, "touched up" by hand engravers, and then hardened as already described.

The engraving machine has thus given a faithful reproduction, on a small or reduced scale, of the artist's work, and will repeat it as often as desired. The matrix produced is in intaglio.

No. 13 on plan (Fig. 1) is the mechanics' shop, which is responsible for the up-keep of all plant and machinery in the mint. It is furnished with the usual outfit of small tools and with the following machine tools: A large lathe capable of taking the rolls from the rolling mill, with a grinding arrangement for same; a small lathe, a milling machine, shaping machine, planing machine, sensitive drilling machine and a radial, a small universal grinding machine for grinding hardened dies, tools, cutters, etc., grindstone, and a supply of drills, taps, reamers, etc.

CONCLUSION.

This article gives a general idea of the arrangement and equipment of a mint and its main features. Mint officials have their own ideas of the treatment of the various metals at different stages, and these ideas have been formed by years of experience. The condition of the metal and the class of machinery employed, are two factors which govern the speed of the machinery employed in the manufacture of coins. Cleanliness and order are essential all the way in every department, from the entrance to the mint premises, of material to its exit as finished coin. The melting furnaces in this article are very ordinary—the regenerative gas furnace with gas producers might be used instead. The annealing furnaces also are very ordinary—"water sealed" furnaces may be substituted, and would considerably reduce the pickling process, and in some instances make it unnecessary altogether.

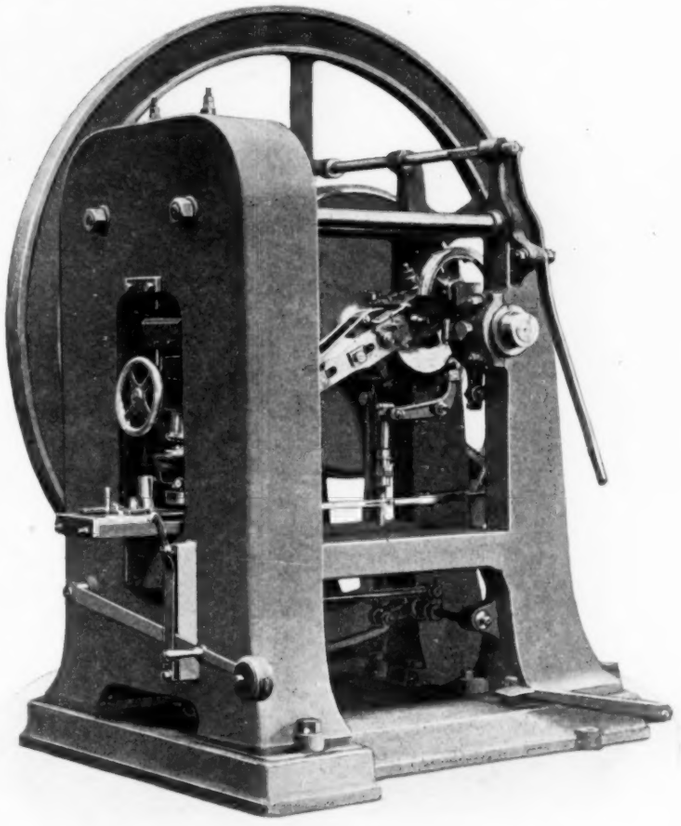


FIG. 4. COINING PRESS MANUFACTURED BY L. SCHULER, LONDON, ENGLAND.

Readers will probably be able to suggest other alterations and, possibly, improvements, in the general arrangement and equipment. This article gives a general idea of what is required, and most certainly gives the start to the man who is going to build a mint, and if he discusses the details with the mint officials he will be able to bring the work to a successfud issue.

WRECK OF THE MAYFLY.

The Mayfly, the first airship of the Britsh Admiralty, which was constructed by Vickers, Sons & Maxim and described and illustrated in the August number of THE METAL INDUSTRY, broke in two while being taken out of its shed, September 24, before it even started to fly. The accident was attributed to weakness of the central part of the framework, which was 512 feet long.

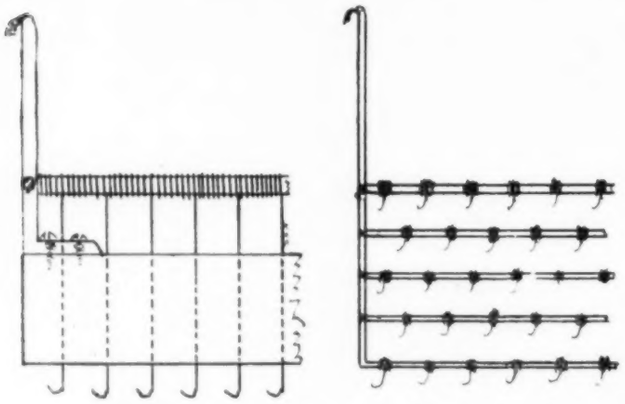
PLATING RACKS.

By Franklin W. Hobbs.*

FRANKLIN W. HOBBS.

While the various forms of plating machines have revolutionized the old method of wiring up work for the plating bath, there are yet many kinds of work which must be either wired up or hung on racks. Furthermore, there are many small shops in which there is not a sufficient amount of work to warrant the installation of a plating machine, so that some form of rack seems to be desirable. Most of the plating racks which I have seen or of which I have read have one glaring fault, namely, that the rack itself presents too great a metallic surface to the plating bath. This surface increases with each succeeding immersion in the bath until after a time it becomes so heavily coated as to be useless. Now its only value is for scrap and it can be sold for but a small part of the original value of the metal. This coupled with the fact that new racks must be constructed from time to time makes it very expensive.

With an eye to overcoming this fault, I have constructed a rack which during several years of use has proven very satisfactory. Confident that many platers would appreciate the value of such a rack I will endeavor to describe its construction. For plating long, narrow plates or the like, where one piece would not be hung below another, I make a rack in which the work hooks are quickly renewed when the deposit becomes so heavy as to make their further use undesirable. In this rack the hook itself is the only part which receives any deposit. Take a piece of hardwood about ¾ by 2½ inches and of a length suited to the tank and work. Bore small holes through edgewise, the distances apart that you want the work hooks. Have these holes just large enough so that the copper wire (I use No. 20 B & S) will run through smoothly. Now from fairly heavy brass or copper, form hooks to fit the tank rods, having the lower ends bent at right angles. Two holes are drilled in each of these for screws by which they are screwed to the edge of the wood strip, one at each end. These hooks should be just long enough to allow about one-half the width of the wood to be immersed when the hooks are in position on the tank rod.



SECTION OF FIRST TWO RACKS DESCRIBED.

Now a round rod of brass or iron about ⅜ inch in diameter is cut the length of the wooden strip. About ⅜ inch of each end is reduced to ¼ inch round and holes are drilled in the two rod hooks to fit. Thus the ⅜ inch brass rod will be suspended under the tank rod and above the solution. Mark off spaces on the brass rod the same distances apart as the holes in the wood. Solder pieces of copper wire at each of these spaces and wind the spaces full. Pass the ends down through the holes in the wood and form the hooks on the ends to receive the work. Fit a binding screw to one of the rod hooks where the brass rod enters it, in order to insure good connection, and the rack is ready for use. The only parts that get any deposit are the hooks which project below the wood.

The wood protects the wire where it enters the solution and an extra supply is held above the solution on the brass rod. When the hooks become too heavily coated to be of further use they are quickly cut off close to the under edge of the wood, the binding screw is loosened, allowing the brass rod to revolve sufficiently to unwind wire for new hooks, the ends are pulled through, the hooks are bent and the rack is ready for use again. It will readily be seen that this form of rack will last for years, with very little loss of metal.

For racks to hold small work, where it is desired to hang several pieces, one below another, I construct a frame of light round iron with pieces running lengthwise of the tank, one over another, the distances apart that the hooks are desired. These are soldered to upright pieces which have hooks at their upper ends to fit the tank rods. I then solder pieces of wire the required distances apart and wind each one on the rod in a close bunch, leaving just enough of the ends for hooks. Now tape the entire part of the rack that comes under the solution with electricians' friction tape. In tapeing leave the bunches of wound-up wire and tape them last, each with a short piece of tape. When the hooks become too heavily coated cut them off, then remove the short pieces of tape, unwind a turn of wire and form new hooks, retapeing with fresh tape.

For heavier work like range bands or rails, I form a piece of small brass or iron into three sides of a square and bend the ends into hooks to fit the tank rods. Then from two pieces of smaller brass wire I form a series of brackets which are soldered to the two upright sides of the frame and all parts taped except those actually coming in contact with the work to be plated. In the iron frame racks where the tank hooks are iron, that part will of course need to be tinned or coppered so as to insure good contact.

*Foreman plater, Wood & Bishop Company, Bangor, Me.

CERESIN WAX.

Ceresin.—Melts at 140 to 149 degrees Fahr. It has nearly the same properties as beeswax. It is simply ozocerite purified by means of sulphuric acid. It is mainly used as a substitute for beeswax and as it is white it is colored with gamboge and turmeric.

NON-FERROUS METALS IN RAILWAY WORK.

A Classic Article Giving a Description of the Application of the Metals in Railroad Equipment.*

By George Hughes, Inst. C. E., M. I. Mech. E.†

The modern British locomotive, as exampled in Fig. 1, is one of the 4-cylinder passenger engines of the Lancashire and Yorkshire Railway. In the design and construction of this type of engine the author, moved by commercial considerations, has kept down the use of copper and brass mainly to those parts for which no reliable substitute has yet been obtained.

On this locomotive, having a total weight of 87 tons 15 cwts. empty, the weight of copper and brass is as follows:

	Tons.	Cwt.	Qrs.	Per Cent.
Copper plates	2	15	0	3.1
Copper stays	0	16	0	0.9
Copper pipes	0	5	0	0.3
Brass work	2	2	0	2.4
Total brass and copper	5	18	0	6.7
Other material	81	17	0	93.3
Total	87	15	0	100.0

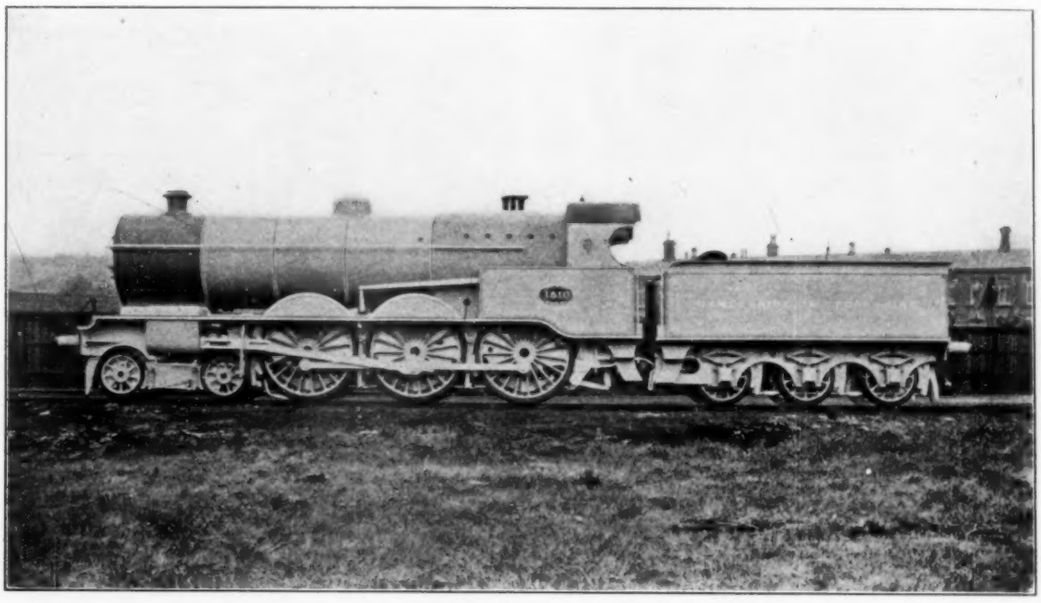


FIG. 1. FOUR-CYLINDER PASSENGER ENGINE OF THE LANCASHIRE AND YORKSHIRE RAILWAY, ENGLAND.

This table excludes copper tubes, which are only used on some engines of this class. When copper tubes are included, the weights and percentages become:

	Tons.	Cwt.	Qrs.	Per Cent.
Total brass and copper	11	7	0	12.9
Other material	76	8	0	87.1
Total	87	15	0	100.0

COPPER.

Plates for Locomotive Fireboxes.—Although steel has been used experimentally, more or less, copper is the standard practice for Great Britain, the Colonies and Dependencies, the Eastern Hemisphere, and South America, whilst steel is the practice of the United States and Canada. The experience of the Eastern Hemisphere in regard to steel fireboxes is, that owing to serious corrosion on the water side and cracking of the plates after a very short service, this material has been abandoned. Copper plates used on the Lancashire and Yorkshire Railway are purchased to a Specification, which is identical with Class A of the Engineering Standards Committee's Specification of 1906, and includes chemical analysis, and tensile and bend tests, every plate being annealed by the maker.

Flanging.—Copper fireboxes are normally made up of three separate plates, viz., firehole door-plate, tube-plate, and wrapper. The two former are flanged by hydraulic press (Fig. 2), the latter plate being bent cold to shape, by pulling over a shaped block (Fig. 3), and the waist is formed as shown in Fig. 4.

Life of Fireboxes.—It is difficult to make just comparisons. The life of copper boxes and component parts is influenced by many contingencies, such as pressure, constant employment, and the admittedly more severe use during the past few years; that is to say, the life depends more upon the tons hauled than the actual miles run, and during the past few years more tons have been hauled per train-mile than formerly. Copper fireboxes on the Lancashire and Yorkshire Railway have a life of from ten to sixteen and a half years. The older engines with 140 lbs. pressure are found to run their fireboxes up to as much as 500,000 miles; an average figure for seventy engines being 310,000 before replacement by new ones. In Standard engines, such as the Radial Tank and six-wheeled coupled Goods classes, working at 160 lbs. pressure, the average life of a copper firebox is eleven years, with average mileages at 272,000 and 235,000 respectively. These figures are based upon records of 120 locomotives. The author has not as yet any authoritative figures to put forward as to the life of fireboxes of the larger Belpaire type of boiler of 180 lbs. pressure. Individual copper tube-plates in the fireboxes above named require renewing during the life of the box, and here again the older engines show longer mileages for the lower pressures. In the Radial Tank class, records of 53 tube-plates show an average life of seven and three-

*From a paper read at Autumn Meeting, Institute of Metals, New Castle-on Tyne, England, September 20-22, 1911.

†Chief Mechanical Engineer, Lancanshire and Yorkshire Railway.

quarter years with 205,000 miles before renewing, whilst the six-wheeled Goods average 135,000 miles for 144 tube-plates. The remaining plates, viz., door and wrapper plates, practically do not require replacing during the life of the firebox, but certain repairs and patches are fitted if necessary.

FIREBOX STAYS.

Copper Bolt.—With the exception of the United States, copper is the universal material employed for this purpose. It is the most reliable. Some proprietary articles or mixtures have been tried from time to time, but so far without success. In regard to bronze stays of varied

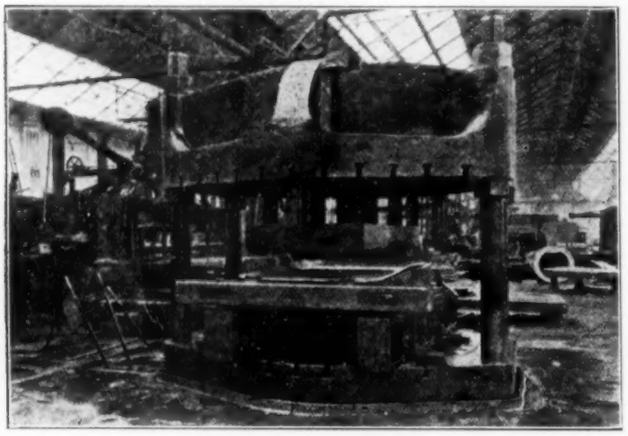


FIG. 2. HYDRAULIC FLANGING PRESS.

compositions, they get slack in the plate by reason of the different expansions, and the heads burn and drop off much more readily than copper. There is a tendency for the copper plate to bulge round the head of the stay, and copper stays withstand this much better than an alloy.

Copper bolt for stays is specified to contain slightly less arsenic than in the case of plates. Table I shows tests from various consignments, which consignments regularly comply with a specified minimum tenacity of 14 tons per square inch, and a 40 per cent. extension on 8 inches.

Typical analysis:

Copper.	Arsenic.
99.4	0.33
99.2	0.37
99.42	0.27

TABLE I.—Test of 1 Inch Diameter Copper Bolt. Length of Specimen, 8 Inches.

Maker.	Tons per Square Inch.	Description.	Per Cent. of Original Length.	Percentage Contraction of Area.	Remarks.
"A"	15.2	Tensile	43.0	68.64	Close bent test double.
"	14.8	"	45.0	71.6	" "
"	14.9	"	47.0	68.64	" "
"B"	14.8	"	51.0	68.8	" "
"	15.0	"	49.5	70.0	" "
"	15.06	"	49.0	68.8	" "
"C"	14.53	"	46.5	64.4	" "
"	14.62	"	47.5	60.6	" "
"	14.59	"	45.0	56.7	" "
"D"	14.82	"	45.0	58.1	" "
"	14.72	"	47.0	60.6	" "
"	14.82	"	47.5	65.5	" "
Average	14.82	...	46.9	65.19	....

Manufacture.—Copper stays 1 in. diameter, screwed 11 threads per inch, are the standard practice. They are screwed at both ends, the center being turned down below the bottom of the thread to ⅞ in. diameter. The over-all length varies from 4⅛ ins. to 7½ ins., according to position in firebox. They are turned direct from the bar on modern automatic machines from round annealed bars supplied by the makers and passed through the reeling mill before turning. Fig. 5 shows one of three full automatic machines regularly employed on stays. The stays are inspected for ragged threads, flats and seams developed after screwing, and correct pitch of thread, a limit of 12/1000 in. being allowed at the ends.

The total rejections are about 2 per cent., the greater part being due to the material and not to the inaccuracy of the machines themselves. Broadly speaking, the bolt bar which screws best is that which has the slightly higher tenacity after annealing.

Copper Pipes.—Copper pipes are invariably solid drawn and seamless; they range from small lubricating pipes of ⅜ inch external diameter and No. 16 I.W.G. to main steam pipes 6⅜ inches in external diameter of No. 5 I.W.G. The internal pipes of the boiler consist of solid-drawn tube ¾ inch to 2½ inches in diameter, and of No. 10 and 11 I.W.G. for the injector and ejector, steam, exhaust, and delivery pipes. The internal main steam pipe is a straight piece of 6 inch diameter No. 6 I.W.G., with brass cone and flange at the ends. The smokebox steam pipe is 5½ inches inside diameter, No. 5 I.W.G., with flanges brazed at each end. These pipes are received hard from the makers, and cut to lengths at the Railway Company's Works.

Brazing.—Flanges of brazing metal (Copper 84 per cent., Zinc 16 per cent.) are machined inside and on the front face. Before brazing, the copper pipe is first annealed to a temperature of 650 degs. C. and allowed to cool. After filling with molten resin, and plugging each end with lead, it is bent cold to template in a hydraulic press, being afterwards hammered to remove slight kinks. After warming to melt the resin out, it is treated

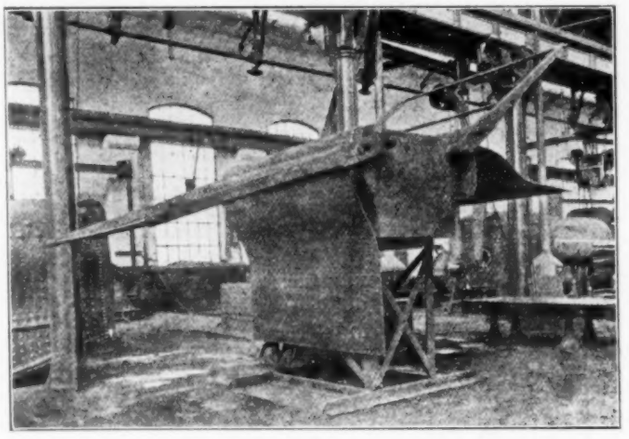


FIG. 3. SHOWING COPPER WRAPPER PLATE BEING BENT TO SHAPE.

a second time in a furnace to a blood-red heat and allowed to cool. It is then fitted with loose flanges whilst in its position in the template smoke-box in the copper shop, after which the flanges are brazed to the pipe.

The flange having been fixed to the pipe, as described, and backed over at the front with a pæning hammer, a covering of fireclay is placed on the top and bottom of the flange to protect it from the coke fire. Granulated brazing solder (Copper 58.3 per cent., Zinc 41.7 per cent.) is then put on the top joint, a clay channel being formed on the top between the flange and the pipe, and ground borax is used as a flux to assist the solder to run

freely. The pipe and flange are embedded in clean foundry coke and air-blast applied; liberal use of flux and solder is made, and the pipe is heated until the metal runs in the joint satisfactorily, the copper pipe attaining a good red heat for about 6 inches above the joint. The operation takes fifteen minutes. Pyrometer readings show a temperature in the center of the brass flange of 865 degs. C. as the highest during the operation. The brazing solder used has a melting range of 780 degs. to 790 degs. C. The pipe is now taken off, allowed to cool (the fireclay cover and superfluous metal being removed), and subjected to a hydraulic test of 350 lbs. per square inch.

Cold bend tests on strips sawn close to the brass, when the brazing has been carefully performed, show no deleterious effects on the material, the strips bending close double as good copper should which has not been spoiled. Owing to the fact that copper loses its tenacity at high temperatures, and that the range between the brazing heat and the melting point is narrow (865 degs. C. and 1,050 degs. C.), it follows that the value of a brazed joint is in proportion to the skill of the workman, and perhaps no operation depends so much upon the operator; consequently, this is a valuable point for discussion.

To further illustrate the time and temperature conditions during this important operation, the author has recorded a heating and cooling curve taken by means of a Platinum-Platinum-Iridium couple working in conjunction with a Thread Recorder. In the experiment, a ½-inch hole was drilled through the brass flange, and after fixing the copper pipe ready for brazing, a thermocouple was inserted at the junction of the pipe and flange, and attached to the recorder. Both instruments were calibrated before and after use.

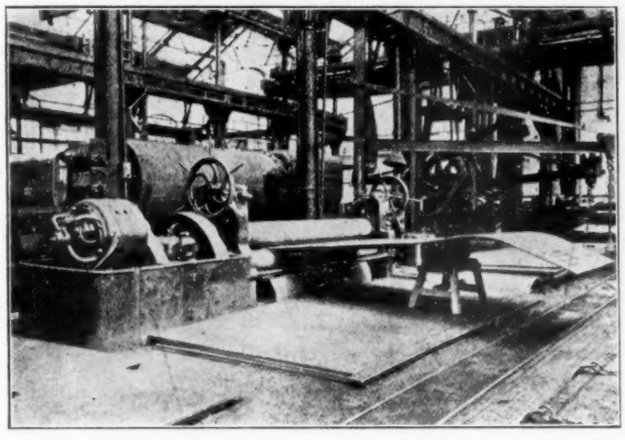


FIG. 4. FORMATION OF WAIST IN COPPER WRAPPER PLATE.

The operation of heating up and brazing occupied a period of eight minutes, the maximum temperature attained being 865 degs. C. The pipe was then withdrawn from the hearth and allowed to cool down to 300 degs. C. before finally cooling off.

WEAR AND TEAR OF COPPER STEAM PIPES

Failures of copper steam pipes may be classified under three heads:

1. Cracks in the pipes close to the top flange. It is particularly noteworthy that these cracks occur at the top flange, connecting to the boiler T pipe. This suggests that the "breathing" action which occurs is concentrated at this spot, instead of the whole length of pipe taking its share; the bottom flange being more in the line of direct stress does not flaw, the expansion occurring at the top, and the remedy is to make an easier sweep in the pipe instead of a short, stiff bend.
2. Wear or abrasion of the pipe body. Abrasion of the body of the pipe is the result of the blast action on the fire, both gases and cinders meeting the pipe on their passage to he chimney. The greater wear takes place about half-way down, and to alleviate this action, pipes are bent as much as possible out of the line of draught.
3. In cases where a brass nipple is brazed in the middle of the pipe for lubrication connections, trouble with cracks in the pipe has been experienced, but this practice is discontinued. Some of the cracks which the hydraulic test disclosed in steam pipes taken from engines undergoing repairs, were possibly due to workmanship in stripping the connections; others were caused by local hardening due to brazing at this point, and to resistance which the nipple would set up to wriggling, *i. e.*, a considerable number of small changes of position.

Steel steam pipes are now being used to replace copper on engines fitted with steam superheaters which attain temperatures of 650 degs. F. When the engines are at work, the smokebox temperature is from 700 degs. F. to 900 degs. F.

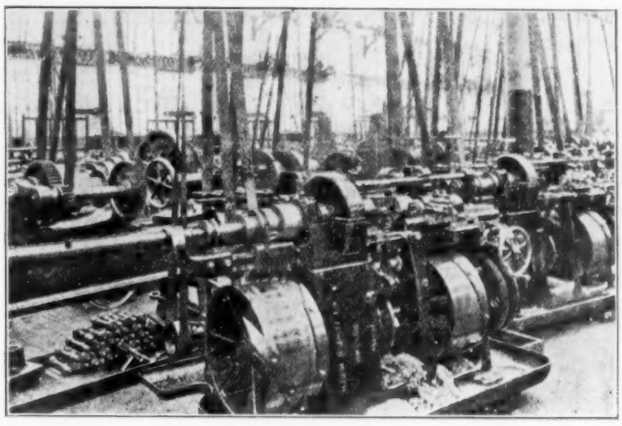


FIG. 5. AUTOMATIC MACHINES MAKING STAYS.

BOILER TUBES.

Copper and steel tubes are used, and their life in locomotive boilers, taken over a period of eight years, is as follows:

Copper, 1st period (New)	110,000 miles
Copper, 2nd period (Drawn)	80,000 "
Copper, 3rd period (Pieced)	50,000 "
Total	240,000 miles

and subsequently 30 to 40 per cent. of those pieced are treated so again.

Steel, 1st period (New)	70,000 to 80,000 miles
Steel, 2nd period (Pieced)	30,000 to 40,000 "

COPPER ALLOYS.

Before considering specifically these alloys, the author thinks it will be interesting to preface this section with the method of dealing with the large amount of scrap, which, in all large establishments, is of considerable quantity and importance per annum. This comprises articles, which, worn out in service, are sent in to the central depot for utilization and disposal. The economical working up of this material presents a problem to those responsible for the brass foundry costs and workings, and some account of its disposal may be of interest.

Considered under the headings of "Home" or "Rolling Stock" scrap, and "Outside" material from all other departments, the first is fairly readily accounted for by separating all articles whose composition is known, and using them over again as an addition to the new mixture. Slide valves, for instance, are branded by distinguishing marks cast on, and are used again together with the shop gits in proportion of half old valves and half other constituent metals, these latter not usually

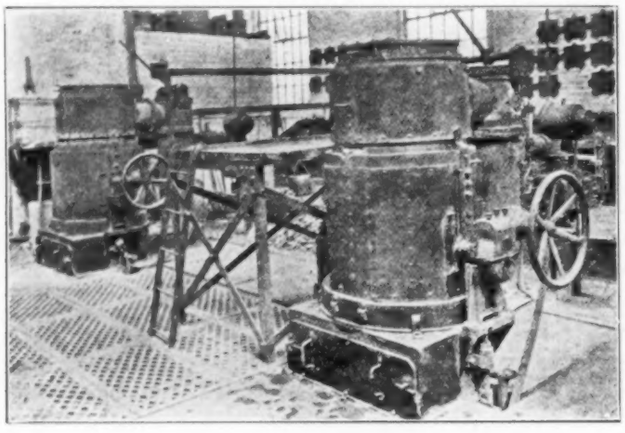


FIG. 6. TILTING FURNACES.

new ingots. Scrap of unknown value from "Outside," as well as borings and turnings from the machine shops, cannot be dealt with so directly. Brass borings received from the machine shop are generally contaminated with iron and steel turnings and sweepings, and also may be mixed with white metal from the boring machines.

In order to separate these ingredients, borings containing white metal alloy are heated on a sloping hot plate over a coke fire, so inclined that as the white metal softens and melts, it gradually runs off into a receptacle, leaving the brass to be scraped over the top of the plate.

The whole of the brass borings received for melting-up are passed over a magnetizing machine to extract the iron particles, which are collected and taken away. This makes for cleaner castings and more homogeneous material.

It is then customary to work this up by melting in an air furnace of 25 cwts. capacity, fired by producer-gas. A definite composition is arrived at, and subsequently cast into iron-chill molds in the form of ingots. Such ingots, after their composition is ascertained by analysis, can then be profitably used in many directions, by forming the basis of fresh charges, along with other small amounts of new metal, to give the desired result.

With the scrap is charged 400 lbs. of scrap copper shearings obtained from old firebox plates in the boiler shop, and 30 lbs. of block tin, the whole charge amounting to 20 cwts. This is melted in two to three hours, and covered with a small quantity of sawdust to reduce oxidation. Samples are withdrawn and their fracture noted, and slight additions of tin or other metal made to bring them to one standard fracture; then the charge is tapped out into a 5 cwt. ladle and run into ingots. As showing how closely a charge can be represented by indication of fracture tests, analysis in Table II. are given of consecutive casts as determined by drillings.

This metal is also used for the smaller brass axle-boxes, radial and tender brasses, and for this purpose is poured direct into green sald-molds, and also cast into ingots to form the bulk of many mixtures.

The metal for the ordinary run of castings is melted in a modern type of tilting crucible furnace (Fig. 6) of 400 lbs. capacity, fired by coke and worked by air-blast from a small motor-blower attached to the furnace. The crucible is permanently fixed in the furnace, thereby reducing the risk of cracking due to cooling and handling, and careful records of 45 crucibles show an average life of 39.6 heats before renewal. This method is found to be a distinct improvement over the usual 120 lbs. crucible heated in a coke "pot" fire and withdrawn for casting purposes, both in life of crucible and amount of coke used per cwt. of melted metal.

Table III. records a day's run of such a furnace at Horwich. The coke used was of an average Durham quality, having the following composition:

	Per Cent.
Carbon	89.24
Sulphur	0.86
Ash	9.35
Moisture	0.55
	100.00

LOSS IN MELTING.

Careful check-weighings have been made of metal used and melted, together with loss due to oxidation. The various charges of metal described in Table III. have been poured into the ladle with an average loss in furnace of 1 per cent., excepting charge No. 4, containing a high percentage of zinc, which came out at 2.9 per cent. Also, it may be stated that 450 lbs. charges can be cast with a further, but recoverable, loss of metal of 31 lbs. in the form of shots, skimmings, etc., equal to 0.75 per cent.; this is dependent upon the form and quantity of the moulds, proportions of gates, etc.

(To be continued.)

TABLE II.—ANALYSIS OF BRASS INGOTS MADE FROM SCRAP.

Constituent.	A	B	B¹	C	C¹	D	D¹	E	E¹	F	G	G¹
Copper	86.36	87.15	86.56	86.75	86.95	87.35	87.15	88.53	85.57	86.56	86.36	87.15
Tin and Antimony	7.88	7.80	8.35	7.72	7.64	7.41	6.54	5.91	7.96	7.88	7.09	7.09
Lead	3.21	3.00	3.21	2.87	2.87	2.59	3.62	2.73	3.89	3.35	3.41	3.14
Zinc	2.33	1.93	1.77	2.49	2.33	2.41	2.49	2.57	2.41	1.93	2.97	2.41
Iron	0.21	0.14	0.14	0.14	0.21	0.21	0.21	0.21	0.14	0.28	0.14	0.21
	99.99	100.02	100.03	99.97	100.00	99.97	100.01	99.95	99.97	100.00	99.97	100.00

Average of six (A, B, C, D, E, and F) Tin, 7.49 per cent.; Antimony, 0.08 per cent.
" " (B¹, C¹, D¹, E¹, G and G¹) Tin, 6.93 per cent.; Antimony, 0.16 per cent.
Average of the twelve ingots Tin, 7.21 per cent.; Antimony, 0.12 per cent.

VERDE ANTIQUE.

The following is recommended as a good formula for producing a verde antique finish on copper or brass:

Verdigris	½ lb.
Sal Ammoniac	1 lb.
Cream of tartar	¼ lb.
Chloride of iron in crystals	3 ozs.
Salt	¾ lb.

The work is either brushed with or dipped in the solution, and allowed to dry. No lacquer is required to preserve the finish.

B. WOODS.

THE MANUFACTURE OF WROUGHT BRASS

A Description of Modern Methods for the Production of Plate, Sheet, Rod, Wire and Tube.

By L. J. Krom.

(Continued from March.)

Sheet Strip and Plate Brass.

If the ultimate requirements of an order for brass calls for the metal in the form of large sheets of varying sizes, there are several separate and important operations that have to be performed before the metal is finished. If a large sheet of brass is required, for instance, for sign brass, the gauge is usually specified by the customer, although the purpose for which the metal is to be used puts it in a class by itself. The mixture of which the average sign brass is composed is: Copper 65, spelter 34, with upwards of one per cent. of lead to allow the metal to be cleanly cut and the holes for the screws to be reamed out with no burrs. The metal that is intended for sign brass must be free and clear of blemishes of any kind, as its surface must take on a good polish. The metal is rolled to the required gauge, and before it is polished it must be trimmed or cut to size, and for this purpose the shear shown in Fig. 25 is used, which is known as a 73-inch light squaring shear with pressure plate.

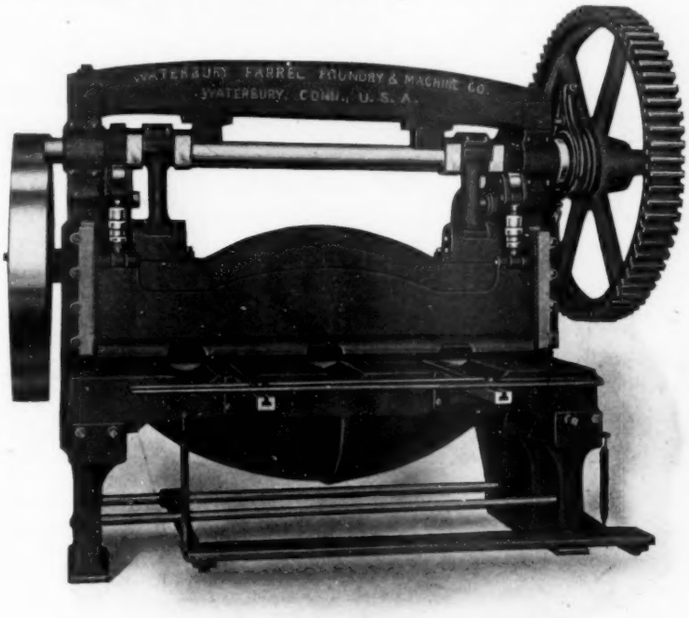


FIG. 25. 73-INCH LIGHT SQUARING SHEAR WITH PRESSURE PLATE.
Capacity, Soft Sheet Steel 3/16 inch, Brass 7/32 inch Thick.

This type of machine in its largest sizes is suitable for shearing sheet steel up to 8 feet in length of cut on ½-inch metal, and they operate also on somewhat thicker sheets of brass. The weights of machines of this class vary from 9,000 to 30,000 pounds, depending on the work to be done. The press shown is one of the lightest, and is made for cutting and trimming sheets 6 feet or less in width. The standard machine has a pressure plate (cam actuated and adjustable for different thicknesses of metal) for keeping the work in front of the knives from buckling and crowding; it also has a front extension with a front gauge attached and there is a back gauge.

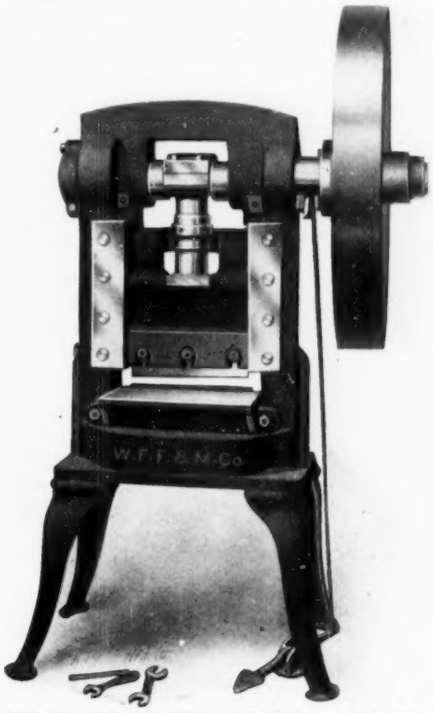


FIG. 27. NO. 2½ PILLAR PRESS WITH SHEAR FIXTURES.
Capacity, Soft Sheet Steel 3/32 inch, Brass ⅛ inch Thick.

TYPES OF METAL SHEARS MANUFACTURED BY THE WATERBURY FARREL FOUNDRY AND MACHINE COMPANY, WATERBURY, CONN.

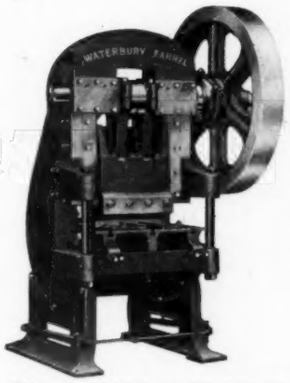


FIG. 26. OPEN BACK PRESS WITH SHEARING FIXTURES.

The press has a Johnson clutch for starting and stopping the crank-shaft; the clutch is operated from the foot treadle. The machine is run, as shown, with power. This shear can also be direct connected and run with an electric motor, and this is very frequently done, so that the shear can be used at a time when it is not desired to run the rest of the machinery in the same department. If the metal to be cut is narrow and it is desired to cut it only to measured lengths, then machines of the types shown in Figs. 26 and 27 are used. These shears are used also for the cutting up of odds and ends of scrap from the trimming of the large sheets, etc. The cut-up scrap is then returned to the casting shop and put into new metal.

Polishing.

After the metal has been cut to size it is ready for polishing. This operation is accomplished by placing

the sheet or strip of metal on a long board so that it is perfectly level. The board is then run on a roller under a rapidly revolving wheel made up of sections of cotton cloth. The surface of the wheel is dressed with a material known as buffing compound, which is made up by mixing all the fine Tripoli powder that any determined quantity of stearic acid or tallow will assimilate when melted. Sometimes a small amount of paraffin or beeswax is also put in to act as an aid to the stearic acid in holding the compound to the wheel. As a rule two grades of compound are used: one coarse, for "cutting down," or starting to put on the polish, and a finer one for the finishing polish. A finishing rouge is also used, which is made of finely pulverized red oxide of iron mixed with stearic acid. While the making of these compounds is a simple proposition, it is more economical to buy them from concerns who make a business of manufacturing them in large quantities. There are a number of standard compounds now upon the market, and a consumer has only to state what he wishes it for, to be furnished with the best possible mixture for his use.

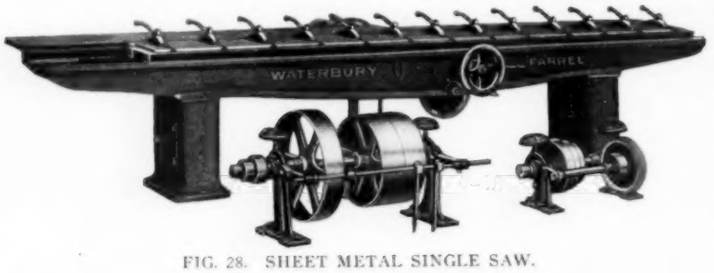


FIG. 28. SHEET METAL SINGLE SAW.

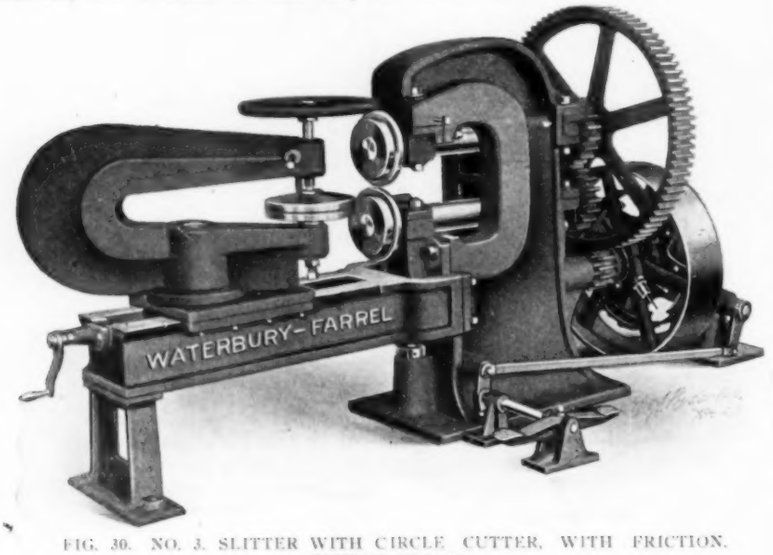


FIG. 30. NO. 3. SLITTER WITH CIRCLE CUTTER, WITH FRICTION CLUTCH PULLEY.

Capacity, ¾-inch Metal up to 46 inches Diameter.

THE MANUFACTURE OF SCREEN PLATES.

Screen plates are the large plates of leaded brass which are used in paper mills to screen the pulp, and are usually made: copper 66, spelter 31-32, and lead 2 to 3 per cent., although there are some plates used that run up to 80 per cent. copper. A screen plate is ¼ of an inch in thickness and is upwards of 50 inches long and 10 to 12 inches wide. The measurements are specified by the consumer and have to be exact. As this gauge metal is too thick to be sheared and leave the edge square and true, it is sawed by means of a metal saw. For this purpose the saws shown in Figs. 28 and 29 are used. For plates that are sawed one at a time the saw shown in Fig. 28 is used. Where it is desired to saw both edges of plate at the same time the metal gauge saw shown in Fig. 29 is used.

Sheet metal single saws are made in several sizes with saws ranging from six and a half to twelve inches in diameter and with tables for sheets from six to twelve feet long. Most of them have power feed and return for the table and there is provision made for several feeding speeds, while the return is usually at a constant speed. Each machine has suitable countershafts furnished with it, cone pulleys on an auxiliary countershaft being utilized for the changes in the speed of the feed. The saw shown is the largest and heaviest made. The table is fed and returned by power, but started, stopped and reversed by hand. The handwheel on the front of the bed can be used to feed the table by hand, the lever at the right controls the return, that at the left the feed. The table has the usual slots and clamps for holding the work firmly.

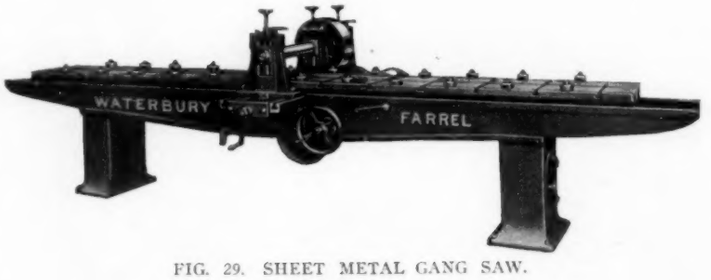


FIG. 29. SHEET METAL GANG SAW.

On the gang saw, Fig. 29, the saws are carried on an arbor, supported by three uprights and can be raised and lowered by screws operated by a single handle; the screws shown on top of the uprights are used to lock the arbor in place. The table has T slots for clamping down the work. There are two countershafts provided with the machine, changes of feed and speed being afforded by their use. The regular counter carries cones for driving the saw and the auxiliary counter, as well as pulleys for returning the table. The other countershaft provides changes of speed for the table feed. The handwheel is used to move the table by hand; the lever to its right controls the power return while the handle at the extreme left throws the power feed in and out.

SHEET BRASS IN CIRCLES.

Brass that is to be used for making seamless tubes is rolled into plate or sheet and then cut into circular form. These circles, as well as smaller ones for use in spinning such as kettles, large bowls, globes, or anything of like nature, are cut on a machine of the type shown in Fig. 30. This machine is a single slitter fitted with an extension and C holder frame, the cutters and their drive being similar to the standard slitters described in previous chapters of this article.

(To be continued.)

THE CORROSION OF BRASS.*

With Special Reference to Condenser Tubes.

By Paul T. Bruhl, M.Sc.†

INTRODUCTION.

The problem of corrosion has been a subject of investigation for many years, and much work has been done in connection with this important subject. Iron and steel practically monopolized attention for a considerable period, with the consequence that the corrosion of copper and brass was somewhat neglected. The enormous industrial importance of the copper-zinc alloys at the present day, and their frequent failure, have gradually brought home to both manufacturers and users the necessity for fuller investigation. A committee appointed by the Institute of Metals has been collecting data on the subject and inaugurating a systematic and complete series of experiments. There can be little doubt that so active a crusade will sooner or later be productive of much good.

CLASSIFICATION OF CORROSION.

The corrosion of brass condenser tubes may conveniently be classed under four heads:

1. Corrosion proper; where the metal is uniformly removed over the whole surface.

2. Dezincification; where the zinc being preferentially more rapidly removed than the copper, the surface of the metal becomes copper-rich in places. The action does not usually extend much below the surface, although it may occasionally be so marked as to result in copper "plugs."

3. Pitting. This is by far the most serious form of corrosion, as it considerably curtails the life of the tube. It is due to galvanic action between the deposit on and the metal of the condenser tube. It may occur in any portion of the tube, that is to say, in the roof and sides as well as along the floor. It most often occurs in the lowest portions of the tube because of the natural downward gravitation of any extraneous sediment, or of any insoluble product of corrosion.

4. Erosion. Here the mechanical influence of the stream of cooling water comes into play. Its effect is small and, under ordinary circumstances, uniform.

EXAMINATION OF SOME CORRODED SPECIMENS OF CONDENSER TUBING.

The following description of five selected cases may serve to illustrate the effects observed in practice. The samples were supplied through the kindness of Engineer Vice-Admiral Sir H. Oram.

Specimen 1.—This tube, four years old, was situated in the eighth row from the top; the water circulated through the tube, and, entering at the bottom of the condenser, discharged at the top. The quality was a 70/29/1. Serious pitting, which in places had pierced the tube, had occurred, the pits being roughly funnel-shaped, with the larger diameter on the water side. Besides the usual corrosion products, both iron hydrate and insoluble matter were present. Specks of spongy copper were common. The pit was not unfrequently filled up by the deposit.

Specimen 2.—The tube (70/29/1) was seven years old, and taken from the bottom row. The circulating water passed through the tube, entering at the top of the condenser. The deposit was principally the green basic chloride. Dezincification was not pronounced, for the lustre of a freshly sci tched surface was quite normal; the interior surface of the tube was smooth, and one small hole only had formed along a line of season cracking.‡

Specimen 3.—The tube was a 70/29/1, two ears old, and taken from the sixth row from the bottom of the condenser. The circulating water was outside the tube, the inlet being at the bottom of the condenser. The deposit was dark brown in color, the green oxychloride being practically absent. The edges of the pits seemed to be somewhat steeper than in the two preceding instances.

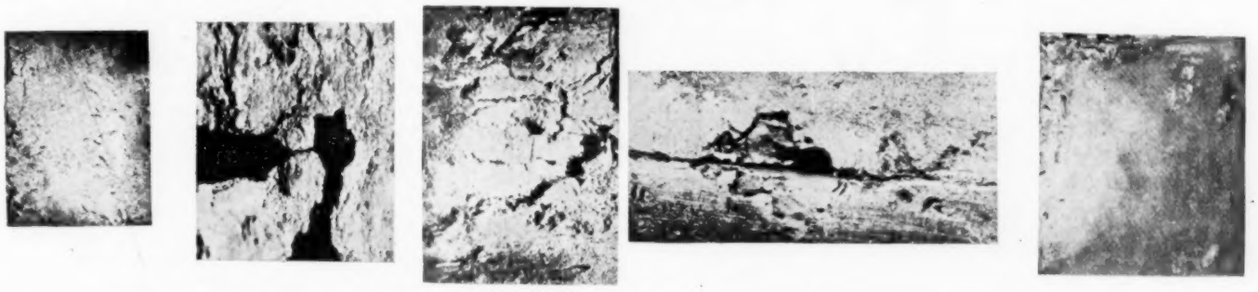


FIG. 1, STAGE 1 IN CORROSION, INCIPIENT PITTING. FIG. 2, STAGE 3 IN CORROSION, HOLES IN TUBE. FIG. 3, STAGE 2 IN CORROSION, PITTING MUCH MORE PRONOUNCED. FIG. 4, CONDENSER TUBE, SHOWING SEASON CRACKING AND MARKED PITTING. FIG. 5, PHOTOGRAPH ILLUSTRATING THE PEELING OF COPPER.

Specimen 4.—The tube (70/29/1) was five years old, and taken from one of the top rows of the auxiliary condenser. The circulating water passed through the tubes, entering at the bottom and discharging at the top. There was very little deposit and no pitting, the tube having rejected because of incipient season cracking.

Specimen 5.—The tube (70/29/1), four years old, was one of a number removed at random from the condenser for inspection. The circulating water passed through the tubes, entering at the bottom and discharging at the top. The deposit was rich in iron hydrate and poor in the basic chloride. Dezincification was marked.

The examination of these tubes seemed to show that iron hydrate is by far the most injurious constituent of the deposit, being more electro-negative than cupric oxide and the basic chloride. Specimen 1, which had

*From a paper read at Autumn Meeting, Institute of Metals, New Castle-on-Tyne, England, September 20-22, 1911.

†Bowen Research Scholar, University of Birmingham.

‡Season cracking is attributed to excessive work with insuffient annealing. The resulting strained condition of the crystals leads in time to a split. Hard-drawn seamless tubing (65 per cent. copper, 34 per cent. zinc) was seriously affected by ammonia water, the fracture along the split being strongly crystalline. Professor Carpenter regards the cracking as due to the gradual change of the unstable β into the brittle $\alpha+\gamma$.

Perhaps some rough handling of the tubes when in the neighborhood of the critical temperature (470° C.), as may well occur during annealing, may act as a predisposing cause to season cracking.

a deposit assaying 8.6 per cent. ferric oxide and 0.27 per cent. insoluble matter, was much more pitted than specimen 5, which gave the values 1.5 per cent. and 0. 41 per cent. for the same impurities. Tube 2, which had been in use for seven years, was hardly affected at all, though well covered with a thin film of the green oxychloride.

SUGGESTED REMEDIES.

A remedy which suggests itself immediately is the use of some protective coating, which should be electro-negative preferably to iron hydrate. Tinning is certainly useful, though by no means a sovereign remedy, because the layer of tin is not always intact. The application of a coating of iron oxide by the method suggested by Mr. Uthemann is excellent so long as it affords complete protection over the entire surface. But the method appears somewhat risky, as any discontinuity would only aggravate the evil it was intended to counteract.

Another coating is that suggested by B. Müllauer. It is the oxide formed on copper or brass by heating a 5 per cent. sodium hydrate solution to 100 degs. C., and adding 1 per cent. potassium persulphate. The article to be coated is immersed in this bath, and kept moving to and fro. The deposit so obtained is said to be strongly adherent, but was found to scale off in sea water after some four weeks. Its protective action, even when the coating was intact, was not very apparent. The plates showed no signs of any action for three or four days, after which the green oxychloride was slowly formed, probably according to the equation.

$$4CuO+2NaCl+CO_2+3H_2O=Na_2CO_3+(3CuO\,.\,CuCl_2\,.\,3H_2O).$$

The loss in weight was—

	Copper.	Brass.
0-1 week . .	0.00094	0.0005 grammes per square inch.

T. B. Allen heats the metal in contact with silicon to a temperature below the melting points of either in a non-oxidizing atmosphere. An alloy of silicon and the metal is thereby produced on the surface, which is then said to be more corrosion-proof.

On the whole, however, the question of lessening corrosion by protective coatings does not promise to be of economic usefulness in the case of condenser tubes. The line along which future investigation ought to be made is the study of the alloys of brass with one or even more other substances, with a view to obtaining a mixture which will give the requisite mechanical properties, and, at the same time, be the least influenced by sea water. Were there no reasons against the circulation of the cooling water along the outside of the tubes, the use of zinc, as has been pointed out by Bengough, might at once put an end to the trouble. The addition of 1 per cent. tin, as in the usual Admiralty specification, does not appreciably affect the E. M. F. Its protective action probably depends on the comparatively inert tin oxide produced. The principal evils to be contended against are iron hydrate and carbonaceous matter. It is admitted that vessels which spend the greater portion of their time at sea beyond the limits where town sewage and river dirt contaminate the water experience fewer troubles from pitting than vessels which ply up and down foul rivers. It follows that the marine engineer should make a point of flushing out his condenser with clean water on arriving in port. The iron hydrate is derived no doubt from the cast iron end cover and the inlet pipe, although scale may be drawn in with the cooling water. It would therefore appear advisable for the end cover and inlet pipe to be made of brass.* Further, the use of some form of filter for the incoming water would be advantageous. Of these filters many forms are on the market, and some in actual use in electrical installations which obtain their water supply from dirty canals.

*Although the author is aware that the British Admiralty hold strongly to the view that cast iron is best suited for the manufacture of the end covers.

EFFECT OF STRAIN.

The irregular distribution of strain on any metallic surface gives rise to differences of potential. In order to investigate this point short lengths were procured of condenser tubing of the following compositions:

	Per Cent.		Per Cent.
Copper	70	Copper	70
Zinc	30	Zinc	29
		Tin	1

These lengths were wiped down with cotton waste and then dipped into potash and clean water to remove any adherent grease. The potential differences of the two ends were next immediately ascertained by comparison with a standard electrode. The electrolyte used was synthetic sea water of the following composition:

	Per Cent.
Sodium chloride	2.7
Magnesium chloride	0.36
Magnesium sulphate	0.23
Calcium sulphate	0.14
Potassium chloride	0.07

The first endeavor made was to obtain a standard electrode against which various condenser tubes could be compared with respect to potential differences. An amalgamated zinc strip immersed in the deci-normal solution of the sulphate was tried but found unsatisfactory. A calomel electrode was then prepared with satisfactory results. To prevent any error from the mutual inter-diffusion of the electrolyte and the Hg_2Cl_2—KCl solution of the standard electrode, the solution in the standard was replaced thrice daily, while the electrolyte was still more frequently replaced. As a result of the tests it was found that no tubes showed a difference of potential between the two ends of more than 0.0002 volt: It was noticed that when a comparatively slight strain was put on such a tube, as by gentle polishing with emery paper, the result was an appreciable rise of potential, which tended to reach a maximum with further polishing. The solution pressure of tubes of the 70/29/1 mixture was very similar to that of the 70/30. The above experiments proved a condenser tube does exhibit differences of potential along its length; but these differences are not sufficiently large and abrupt to explain any corrosion other than a more or less uniform one extending over the whole surface.

THE EFFECT OF CRYSTAL SIZE.

To test the influence of crystal size on the rate of corrosion, six 70/30 plates were taken in the hard rolled condition, three of them being then annealed at 700 degs. C. for ten minutes, the other three at the same temperature for three hours. By this means two sets of plates were obtained, one with small crystals, the other with crystals very much larger, and as both sets were cut from the same strip, they were, of course, of identical composition. After thorough cleaning with dilute sulphuric acid and emery paper, the plates were weighed and immersed in synthetic sea water, which was kept stirred on an average for ten hours a day. No precautions were taken to maintain a constant temperature. The plates were removed

from time to time, washed in a stream of water, dried with alcohol, and reweighed, with the following results:

LARGE AND SMALL CRYSTAL STRUCTURES.

Loss in Grammes per 46 Square Inches of Surface.

	Time in Weeks.					
	0-1.	0-3.	0-6.	0-9.	0-12.	0-15.
S 1	0.0493	0.0751	0.1711	0.2893	0.4893	0.5839
S 2	0.0512	0.0800	0.1714	0.2918	0.4905	0.5600
S 3	0.0520	0.0795	0.1776	0.3186	0.4991	0.5653
L 1	0.0518	0.0853	0.1710	0.3168	0.5203	0.6253
L 2	0.0456	0.0542	0.1663	0.2996	0.5307	0.6518
L 3	0.0445	0.0694	0.1622	0.2873	0.4996	0.5994

The loss in weight during the first six weeks shows on the whole that a small crystalline structure is conducive to more rapid corrosion. If we suppose that the electromotive force remains unchanged with prolonged annealing, it might happen that corrosion will be greater with small crystals than with large ones, owing to the greater surface exposed.

As a matter of fact, however, the electromotive force is raised by annealing—that is to say, the brass, which is now built up of large crystals, tends to disolve faster. Therefore, unless the annealing has been very prolonged so as to ensure a sufficient difference in superficial area, a coarsely crystalline condition, which is the usual case, will mean an increased rate of corrosion. This increase is obviously not due to crystal size, but to a rise in the electromotive force. The method of manufacture of condenser tubes does not permit of serious variations in the crystalline structure, and, therefore, crystal size plays a very insignificant part in the problem of corrosion. The figures given indicate that after some twelve weeks the small crystalline plates, which had hitherto corroded faster, now commence to lose weight more slowly than the large crystalline plates. It would be interesting to ascertain the reason for such a change.

EFFECT OF DIFFERENT ANNEALING TEMPERATURES.

In order to obtain information on this point, three specimens of 70/30 brass were annealed in an electric furnace and slowly cooled. The figures show that corrosion increases with the temperature of annealing. It is not good, therefore, for the final annealing in the manufacture of condenser tubes to be unduly long.

Specimen 1, annealed ½ hour at 330°C.
Specimen 2, annealed ½ hour at 470°C.
Specimen 3, annealed ½ hour at 600°C.

The microstructure is finest with No. 2 and largest with No. 3.

	Loss in Grammes.		
Time in weeks.	I.	II.	III.
0-1	0.0270	0.0315	0.0341
0-2	0.0528	0.0602	0.0663
0-5	0.0732	0.0772	0.0935
0-9	0.0968	0.1014	0.1306

Q_1 (quenched from red heat) = 0.0479
Q_2 (quenched from red heat) = 0.0445
No. 1 (slowly cooled) = 0.0203
No. 2 (slowly cooled) = 0.0207

The effect of quenching is to increase the rate of corrosion.

EFFECT OF ROLLING.

Brass, on rolling, becomes more electro-positive, or, in other words, more liable to corrosion than the soft metal. The energy imparted is partly evolved as heat and partly stored up in the metal as a kind of potential chemical energy; the rolling results in the production of an amorphous modification which is electro-positive to the crystalline metal, and the resultant voltaic effect causes more rapid solution.

To test the effect of rolling, three plates of 70/30 brass were hard rolled to different extents and then immersed in sea water.

Plate H_1 was 0.1 inch thick.
Plate H_2 was 0.0875 inch thick.
Plate H_3 was 0.075 inch thick.

The loss in grammes per square inch surface was as follows:

Time in Weeks.	H_1.	H_2.	H_3.
0-2	0.0049	0.0053	0.0058
0-3	0.0053	0.0057	0.0062
0-6	0.0083	0.0085	0.0092
0-9	0.0098	0.1010	0.1070

The figures show clearly how the rate of corrosion increases with the amount of work.

EFFECT OF BILGE WATER.

Bilge water was always found in the wooden ships of former years, and was formed by the contact of sea water with decaying wood. Its effect on copper and brass is, as may naturally be expected, much more rapid than that of ordinary sea water, and ships anchored off jetties near which sewage is discharged have frequently been seriously affected. The action seems to depend on the formation of corrosive sulphur compounds, the presence of hydrogen sulphide being readily disclosed by its characteristic odor; hydrochloric acid may also be formed. Wood, kept immersed in sea water, is immune from decay, rot only setting in an exposure to atmospheric agencies. Interesting cases are cited by B. F. Isherwood. One ship stationed off West Africa in the vicinity of a swampy coast had its copper sheathing attacked with amazing rapidity. In the other, the water obtained from a river fed partly from swampy areas was so corrosive that the boilers in which it was used never gave any trouble from scaling.

Some lengths of condenser tubing, containing plugs of seaweed, were immersed in sea water for two months. They were then cut in half in the direction of their length and examined. The outer surface was darkened by a film of sulphide, and showed occasional patches of oxychloride. The inner surface was similarly affected. Dezincification had only taken place to a slight extent; and corrosion, though more marked than in the other experiments, showed no immediate tendency to become dangerous.

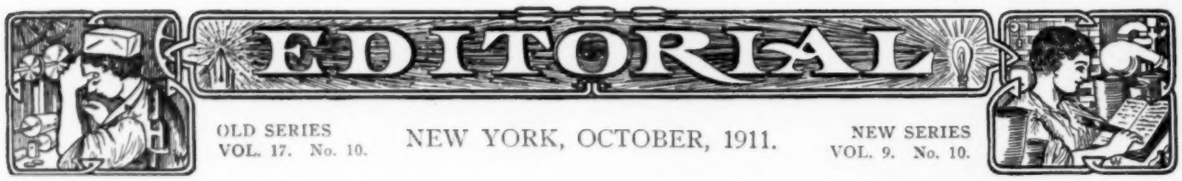
(To be continued.)

CANADIAN RECIPROCITY.

Reciprocity with the United States was defeated at the Canadian general election, held September 21. The Liberal party, headed by Sir Wilfred Laurier, had a majority of 43 in the last Parliament. The majority of the conservatives, whose leader, R. L. Borden, is the new Prime Minister, will be about the same size.

MONEL METAL.

The adaptability of the natural alloy "Monel" Metal for use in large propeller blades was recently practically demonstrated in the presence of a United States Government inspector by dropping 21 times through a distance of 25 feet a 4,000-pound weight upon one of the blades without causing fracture. This cast metal shows a tensile strength of over 75,000 pounds per square inch.



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THE BRASS FOUNDER AND FINISHER
THE ELECTRO-PLATERS' REVIEW, COPPER AND BRASS

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THE CONVENTION CITY

As we go to press the problem is still pending of the location of the Foundrymen's Convention for 1912. As has been announced in these columns, the foundrymen's associations have officially selected Buffalo for the convention city of next year, but after a careful survey of Buffalo's exhibition halls, none are found suitable for holding the exhibit of the Foundry and Machine Exhibition Company, except the new armories, and during the past month the officers of the company and the associations and the local committee have been endeavoring to get permission from the state authorities to use the new 65th Regiment Armory. This splendid building would be, it is believed, all that is desired by both the foundrymen and the exhibition company, and everyone connected with the establishment of the convention hopes that the state will grant the desired permission.

In the event of the state refusing the use of the new armory, the 1912 convention will, it is expected, be held in the middle west, probably at Chicago, and Buffalo will wait until 1913. During the month of September the executive board, the local committee and the secretaries of the allied associations went over the situation very carefully and painstakingly, and the problem of a suitable exhibition hall resulted in the way mentioned above.

It would seem that the selection of a convention city might be settled absolutely a year ahead of the coming convention by the officers of all the organizations thoroughly discussing and determining the advantages of the different competing cities. While the distinct associations might hold separate conventions, the educational societies in one city, and the commercial end in another, still if the foundry industry is to have the benefit of the co-operation of the allied organizations (and most everyone admits that it is beneficial) they, of course, must all meet in one place at the same time. In this relation the necessities of the exhibition company have to be specially considered, for while the foundry associations can meet most anywhere, the company has to go to the city where it can be suitably housed. The final determination, therefore, for a combination convention must rest with the exhibition company. The officers of the company and of the associations are at present working ardently to secure a convention building for 1912, which will be entirely satisfactory to all of the interests and we hope they may be eminently successful.

FUSEL OIL

The letter published in the Criticism and Comment columns of this issue of THE METAL INDUSTRY is interesting, as it gives a clear description of the various applications of Fusel Oil in the United States. Perhaps our correspondent gives a little too much importance to the part that Fusel Oil plays in the manufacture of explosives. In the United States, while it is true that amyl alcohol, which is the amyl principle contained in Fusel Oil, is used to a certain extent in the manufacture of sporting powders, this use is stated by the manufacturers to be less at the present time than formerly and is still growing smaller. No amyl alcohol is used in the United States for what are called high explosives. In France and Germany it is true that amyl alcohol is used for the manufacture of ordinance or military powders, but even this is not compulsory, as alcohol can be used as it is in the United States for these grades of smokeless powders.

The state of the market for Fusel Oil is therefore not affected at all by war conditions. The present high price for Fusel Oil and its subsequent product, amyl acetate, is due entirely to a skillful manipulation of the market by London operators. These parties have agreements with the Russian producers and control the supply from the majority of the other countries which produce Fusel Oil, which practically means all of Europe. A prominent importer of Fusel Oil in the United States declares that the stocks at present of crude Fusel Oil in Russia and Austria are as large as they ever were, there is no scarcity of raw material and high prices are likely to prevail at the pleasure of the syndicate.

Fusel Oil is a clear, fiery tasting and smelling liquid produced in the distillation of fermented products, such as grains, fruits, etc., and the must of grapes. The principal source then being as a by-product in the manufacture of whiskies and other alcoholic beverages. It has a higher distillation point than ethyl alcohol, and consequently is the last product to come from the still. The principal producer of Fusel Oil is Russia, with Austria, France, Belgium and Germany in the order named.

The annual consumption of Fusel Oil in the United States is between five and five and one-half million pounds or from seven hundred thousand to seven hundred and eighty thousand gallons. The United States produces about one-fifth of this amount, and consequently must import the rest on which a duty is paid of one-quarter of a cent per pound. The chief use of Fusel Oil in the United States is for the manufacture of amyl acetate used in the production of lacquers for the brass trade. Amyl acetate is made from Fusel Oil, by combining the oil with acetic acid. The industry using Fusel Oil that is next in importance to the lacquer trade is that of leather, where it is employed in the manufacture of patent and glazed leathers. Our correspondent is entirely correct when he says that if the high price of $3 per gallon continues, brass manufacturers must resort to some other solvent for gun cotton, the base of cotton lacquers, or go back to gum lacquers. Amyl acetate is at present the only known solvent for gun cotton that will give a clear, transparent film when coated on metal objects and dried in the air. There are other solvents for gun cotton, such as alcohol, acetone, etc., but the solutions dry with a milky cloud on its surface. There are already substitutes for amyl acetate, however, and doubtless more will be forthcoming so that these most important industries will not be held long in the grasp of a merciless syndicate.

EXHIBITION OF METALS

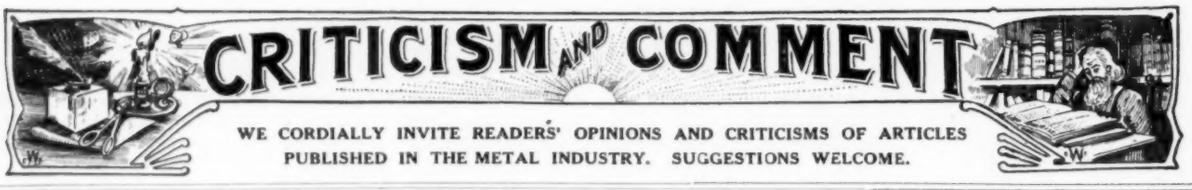
The exhibition of metals (other than iron and steel) and their applications, which will be held in London, England, next May, will be the most remarkable exploitation of the metal industry as separate and distinct from iron and steel that the world has ever seen. The list of branches of industry, etc., that will be represented is given in the ASSOCIATION AND SOCIETY department of this issue of THE METAL INDUSTRY.

It is a remarkable fact that, in spite of the importance to a vast variety of industries in the world of the non-ferrous metal trades, there has never been held an exhibition entirely devoted to the effective display of non-ferrous metals, their alloys, and the apparatus used in their manufacture and subsequent working. The field is a tremendous one, so vast, in fact, that when one comes to look closely into the ramifications of a conglomeration of industries that are concerned with all metals except iron and steel, one wonders whether even so large an exhibition space as is afforded by the Royal Agricultural Hall with its various Minor Halls, can lend itself to an adequate display. We know that there would be no difficulty in filling the Agricultural Hall's vast spaces with products exemplifying any one branch of the iron and steel industry.

But here we are dealing with only one, or at most two, metals, leaving the remaining fifty odd metallic elements to constitute the nucleus of a non-ferrous exhibition. Of these fifty the majority are, at present, of merely scientific, rather than practical, interest; on the other hand we have what may be termed the metals of commerce—aluminium, antimony, bismuth, cadmium, chromium, cobalt, copper, gold, lead, manganese, magnesium, mercury, nickel, platinum, silver, tin, zinc, etc., together with a host of alloys of these and other metals. And there must not be neglected the "Cinderellas" of the metal world, the many metals that at present are not usefully employed in any industry. It was but a few years ago that vanadium, cerium, iridium, selenium, titanium, rhodium, tantalum, osmium, radium, and many others, were merely scientific curiosities, interesting chiefly on account of their rarity and inutility. Now all these metals are profitably employed in the arts, and of a certainty the relentless march of science will indicate uses to which other rare metals may be put, some of which, such as gallium, beryllium, scandium, zirconium,

to mention only a few, are at present entirely in the "curiosity" or "museum" stage, yet are fascinatingly interesting nevertheless, especially in view of their unknown potentialities. The first decade of the twentieth century has seen a tremendous increase in the use of the non-ferrous metals and their alloys. To a great extent this has been brought about by engineering advances in the direction of improved travel facilities. Ten years ago the motor car was an experimental toy, the aeroplane was quite unknown, and the turbine-propelled Atlantic liner was a mere dream. The wonderful system of "tubes," of which London is so justly proud, did not exist, and tramways and electric lighting were still in process of evolution.

Today there are vast industries that are entirely dependent on these things. And these industries are very largely dependent upon the non-ferrous metal manufacturer. Take away copper, and what becomes of the manufacture of condensers, turbines, and electrical apparatus? Eliminate aluminium, and imagine the confusion in the motor industry and the bewildering problem before the airship builder. Consciously or unconsciously the metallurgy of the non-ferrous metals has become a matter of supreme moment to all of us. Not merely are we dependent on this great industry for our transit facilities, it touches our every day life at many other points. Modern printing would be impossible without the readily fusible alloys of lead, tin and bismuth; and for "half-tone" blocks and "electros" we have to thank the electro-metallurgist—who is also responsible for the wonders of electro-plating. The dentist uses mercury, gold, silver, and platinum for our ultimate comfort, and even in medicine the metals play their part. All of these uses of the non-ferrous metals, and many others lend themselves excellently to effective exhibition and display at the forthcoming Non-Ferrous Metal Exhibition at the Agricultural Hall. And every tool and appliance that is used in connection with the manufacture or working of these metals is admissible in the exhibition. The outcome of this exhibition will be closely watched, and if successful, no doubt, similar ones will be held in the United States and other countries.


CRITICISM AND COMMENT
WE CORDIALLY INVITE READERS' OPINIONS AND CRITICISMS OF ARTICLES PUBLISHED IN THE METAL INDUSTRY. SUGGESTIONS WELCOME.

WAR CLOUDS AND THE PRICE OF LACQUER.

To the Editor of THE METAL INDUSTRY:

Everything in the commercial field has its price regulated by the laws of supply and demand. It is not many years ago that Fusel oil was practically a waste product, and the discovery of the means of making amyl acetate from it gave it a much greater value and really was the means of developing the lacquer field, and practically wiping out the old-fashioned shellac or English lacquer, which is today used in very few manufacturing concerns, as the superiority of a good lacquer made of cotton solution and gums is beyond question.

The price of Fusel oil and amyl acetate has advanced within the last two years nearly 200 per cent. and is still climbing. The supply of Fusel oil and amyl acetate, etc., is limited to the amount of wines and liquors that are distilled, while their uses have not been limited to the manufacture of lacquer. Smokeless powder today is made in much the same manner as lacquer, the base being nitrated cotton. The writer's information and knowledge is that amyl acetate is the only solvent for cotton, at least it is the only practical commercial solvent known for lacquer purposes.

Black powder with its smoke, grime, additional detonation and recoil makes it undesirable in nearly every field where an explosive of this character is used. From the sportman's uses to the enormous requirements of the various powers of the world, for supplying the small arms of the army, the field, coast defense and marine guns, varying in quantity of nitro cellulose powder used from 48 to 50 grains for the cartridges used in the modern United States magazine rifle to 268 pounds used in one charge of a modern twelve-inch, breech-loading rifle. The sportsman's uses of smokeless powder are practically the smallest, yet even this requires an enormous amount of amyl acetate to prepare. The army, even for practice and manoeuvres, consumes a great deal of powder and vast quantities must at all times be kept in stock, while the uses for sea coast cannons and our navy are enormous, even in times of peace. The requirements of the powers of the world when at peace may be easily appreciated; the result upon the market price of amyl acetate, Fusel oil, ether, alcohol, cotton, etc., could only be an increase. But the world today, though outwardly at peace, is internally a boiling caldron, there being few powers which are not at the present time or which have not in the recent past, had war clouds, more or less threatening, hanging over them, as well as internal troubles.

Germany, the writer is informed, prohibited the exporting of this much needed material and Germany was the country from which the greater portion of Fusel oil used in this country came. It is said that Germany has been for a long while back using every gallon of amyl acetate herself in building powder and storing it up, and in shutting off this principal source of supply it became possible for those who control the remainder to ask a high price. The dispute between France and Germany has apparently been settled for the time being, but both countries will go on strengthening their defenses and preparing for the inevitable clash which is going to come sooner or later.

In the writer's opinion were there to be a war declared today between the great powers it would be practically an impossibility to buy cotton lacquers at any price, and manufacturers would be compelled to go back to the old shellac, or English lacquer. It would not do to say that a substitute will not be found as a solvent of nitrated cotton, in view of the many seemingly impossible things which science has done in the past, but there is a possibility and a strong probability that the use of nitro-cellulose powder will sooner or later be abandoned by all of the powers of the world, it being a well known fact in ordnance circles that our present powders are highly dangerous and not reliable. No stronger object lesson of this could be shown than the blowing up of the modern French battleship Liberte, it being generally admitted that this was caused by spontaneous combustion or by some means which ignited the gas which passes off from this volatile powder, causing the flame to reach the powder in the magazine and ignite it.

Nitro-cellulose powder if not confined will burn as freely as a tallow candle, but if confined will make gases of high explosive power. The use of nitro-cellulose powder therefore makes every magazine either on ship or ashore an uncertain element and the lives of all whose duty calls them in or near the magazine are in constant danger. The French powder is well known to be inferior to that used by our home government. But, even as the present smokeless powder is a vast improvement over the old charcoal

and saltpeter mixture, so also may it be possible for some one to invent a powder or explosive of sufficient force to take the place of nitro-cellulose powder, which in its manufacture may not require the use of amyl acetate, etc., and with the discovery of such a powder the demand for amyl acetate would be much less than the supply and down would go the prices.

This is not much hope to hold forth, nor is it intended as an argument in favor of increasing the national or international use of wines and liquors, but it is something which is to be expected, and which is liable to happen any day, and let us hope, also, that it will happen, not only that consumers may get their lacquer cheaper, but that these frequent catastrophes on land and sea, because of the use of nitro-cellulose powder, may become unknown in the future. The increased cost of amyl acetate has caused all lacquer manufacturers to raise their prices. Consumers complain and protest, talk trusts and combinations, probably the majority of the concerns have no idea of the real cause of their being asked to pay the price which lacquer and similar materials must be sold for today in order for the manufacturer to make even a small margin of profit.

Now I trust that the reading of this explanation of conditions will not cause lacquer users an undue alarm, nor make them think that in carrying lacquer, that they have in stock a dangerous element, for although some of the ingredients of smokeless powder are used in making lacquer, there is a vast difference and the use of lacquer is really no more dangerous than the use of paints, varnishes, etc. In fact, many paints carry so much benzine that they are much more liable to ignition than modern lacquers. Also, the spraying methods of applying lacquer lessens the risk of fire, the material being contained within the sealed pot of the sprayer; whereas under dip process, open tanks containing large quantities of lacquer are used, making the dip process much more risky and adding a high insurance rate. Brush methods also call for an open receptacle, but there is little if any difference in the conditions of lacquer held in a closed receptacle of a sprayer and an unopened can and it would seem therefore that the sprayer, supplanting old methods, would entitle manufacturers to reduced insurance rate, providing that the sprayer is a sealed receptacle, and so constructed that the material cannot come out of it unless it is sucked out by the discharge of air across the nozzle.

Some makes of sprayers constructed on different principles may discharge their lacquer owing to a leaky valve, but this could not happen with a properly designed sprayer. It may also be said of the spraying process, regardless of what make of sprayers is used, that the manufacturer does not have to throw away dirty lacquer, such as occurs where articles are dipped, and also occurs by brushing. Dip tanks must be emptied and cleaned periodically. The loss of lacquer which becomes dirtied and unfit under the dip and brush process and must be thrown away, amounts to a very interesting total during the year. With the sprayer, the lacquer being poured into it, comes out and is deposited on the work to the last spoonful just as clean as it came out of the original can or drum.

The high cost of lacquer means that manufacturers must study the best means of application and devices for handling their work, which will enable them to use all of the lacquer which they buy and spread it on their goods without coating insides and back parts not necessary, but, which under dip process, consumes as much lacquer as the front or outside. And as lacquer is now high, economy must be practiced also in the application to offset the high price, and manufacturers who are not spraying their lacquer on must wake up to the fact that while they are probably protesting at increased price of lacquer, they are continuing to pay double or triple and sometimes six times the cost of application that they would be paying with modern spraying apparatus and approved racks, revolving devices, trays, etc., which the spraying process makes possible, to handle work rapidly and in quantities. Since the present conditions offer no immediate hope of reduction of the cost of the lacquer, there is nothing for the manufacturer to do but to offset this cost wherever possible by improving his method of applying it and cheapening the cost of doing same.

As the matter stands at present the cost of the necessary solvent is high and will go higher. There is no known substitute and there is no means of adulterating the solvent. For, anything which could be used to adulterate the solvent of cotton, would itself be a solvent and would not then be an adulterant. The solvent does not have the slightest effect upon that body part of the lacquer which remains, as it all evaporates and disappears. It is simply a carrier, a parting guest, which deposits its load and departs. Quality for quality, the same goods must go into the lacquer today and tomorrow that have been going into it in the past. It is up to the manufacturer to practice economy. Stop the waste in dirtied lacquer and the waste in labor, and by these means offset the increased price of lacquer and enamel which is compulsory on account of the cost of raw material.

W. J. SMART,
Artificer 4th Company, 13th Coast Artillery District.
New York, September 29, 1911.

ANSWER TO "THE CHEMIST'S LAMENT."

To the Editor of THE METAL INDUSTRY:

I beg to submit a few words of comment, in answer to "The Chemist's Lament," by Mr. B. W. Gilchrist, appearing in your issue for July of this year. It was somewhat of a surprise to me that no officer or one of the prominent members of the National Electro-Platers' Association saw fit to answer this reflection on the association. As a member of the association it seems to me that they have been bewitched into silence by the poetic genius of Mr. Gilchrist rather than by the soundness of his argument. It is really too bad that the association has no poet laureate to answer him in kind. We can imagine with what gusto and satisfaction were penned the inspiring lines of "The Chemist's Lament."

Of course, it is not our purpose to criticise Mr. Gilchrist's production from a literary standpoint. We concede to him the widest poetic license, even admitting that "brain" and "explain" may be made to rhyme with "name." That's the poet's business and we will not compare his work with others; for as the immortal Dogberry says, "comparisons are odorous." We shall try to prove, however, that there is a cross connection in his argument, and we will endeavor to supply the catalysis for its poetic dissolution. With all due respect for the wisdom of the "folks in Northumberland, Pa.," who would daub Priestly a fool, the writer humbly submits his views in regard to the status of the National Electro-Platers' Association and the qualifications for membership.

It seems to me that the association does not aspire to the broad field of the American Electro-Chemical Society or the Chemists' societies of the country, but is primarily a society for foremen electroplaters; and as such, a great many of its members are little versed in chemistry. To my knowledge there never has been, and it is highly improbable that there ever will be any attempt made to bar from active membership chemists interested in electrometallurgy. We welcome all chemists interested in electrochemistry; but the trouble seems to be that up to the present time, there has not been many chemists lamenting to become members. Like the bakers, barbers and poets they prefer their own societies. To assume that the association seeks to draw a distinction "between those versed in chemistry" is ridiculous, and this reasoning is probably the cause of "Pegasus" stumbling and balking so horribly over the journey that Mr. Gilchrist has driven him. In conclusion, I may be permitted to suggest that, considering the neat and dexterous manner in which Mr. Gilchrist conjures up the shades of the heroes of science, especially in his combat with Lavoisier, the proper field for his literary efforts is tragedy. He should cease flirting with the lyric muse and invoke the favor and guidance of Melpomene.

EMMANUEL BLASSETT, JR.
Bridgeport, Conn., September 9, 1911.

STANDARD SPECIFICATIONS

The September issue of THE METAL INDUSTRY contained a letter from Ernest Lewis, metallurgist of Birmingham, England, regarding the standard specifications for copper, spelter and manganese bronze ingots recently adopted by the American Society for Testing Materials. Regarding the formula for manganese bronze ingots Mr. Lewis was made to say that the content of copper should be from 50 to 58 per cent. This was an error, and should be from 54 to 58 per cent. copper, with the spelter in corresponding proportions.

NEW BOOKS

"THE PRINCIPLES OF ELECTRO-DEPOSITION." By Samuel Field, head of the Department of Technical Chemistry, Northampton Polytechnical Institute, London. Size, 5¼ by 8 inches. 383 pages, with index, and 120 illustrations. Bound in cloth. Published by Longmans, Green & Company, New York. Price, $2. For sale by The Metal Industry.

This book is written as a laboratory guide to electroplating, and is made up of twenty-six chapters and an appendix. The subject matter contained in the book relates to a general description of voltaic cells and accumulators and the properties of the electric current. The details of work, shop practice are but briefly treated, although in chapter three the simple parts of the dynamo are explained. A complete discussion of quantitative electro-deposition, together with the processes preparatory to plating and the general properties and preparation of solutions, their densities, etc., are given. The deposition of the various metals, such as copper, nickel, iron, tin, zinc, silver and gold are given considerable attention in chapters 12 to 17 inclusive.

The subject of electro-brassing and metal coloring are handled in a comprehensive and thorough manner, while several chapters are given over to qualitative and quantitative analysis, and instructions are given for the estimation of cyanide and other constitutents of plating solutions, which make this portion of the book especially valuable to persons who are not thoroughly conversant with chemical operations. A valuable portion of the book is the chapter on the recovery of metals, in which full directions are given for the recovery of metals from solutions, residues, etc. Taking the book all in all it will make a valuable addition to any electroplater's library.

Shop Problems

IN THIS DEPARTMENT WE ANSWER QUESTIONS RELATING TO SHOP PRACTICE OF THE METAL INDUSTRY. ADDRESS THE METAL INDUSTRY.

ALLOYING

Q.—Can you kindly give us a mixture suitable for valve discs for high pressure and superheated steam?

A.—A valve disc taken from a valve made for superheated steam by one of the large valve makers of the United States had the following analysis:

Nickel	66.80
Copper	27.00
Manganese	2.20
Iron	2.30
Carbon	0.50
Silicon	0.30
Cobalt	0.05

This analysis shows that the disc was made of Monel metal, which is satisfactory for such work, but on account of its high melting point it is difficult to handle in an ordinary brass foundry.—J. L. J.

BUFFING

Q.—What is considered the maximum limit of diameter for a rag buffing wheel, sewed or not sewed, running at about a speed of 2,200 r. p. m.?

A.—If the machine is of sufficient strength, say, 1¼-inch spindle then 16-inch buffs could be used safely at 2,200 revolutions per minute, for cutting down purposes, but for coloring, use a 12-inch wheel. Sewed buffs are the best, and a good quality of tripoli should be used as it saves buffs, also time and labor. A cheap tripoli always costs more in the long run than the best. The width of the wheel would, of course, be gauged by the shape of tubing. I should advise 2½ to 3 inches for straight tubing, the tubing to be drawn diagonally across the face of the wheel for the cutting down operation and a 2-inch wheel for coloring. Run the tubing lengthwise in this operation. If you have a large amount of tubing to buff, I would advise putting in an automatic tube buffing machine as an economical equipment. —T. C. E.

CEMENTING

Q.—We would thank you to advise us of the best quality of cement to use when fitting porcelain handles on brass stems.

A.—Potassium silicate gives excellent results as a cement for securing porcelain to metal. Allow one or two thousandths for the cement, the closer the fit the tighter the cement will hold to the metal. Litharge mixed with glycerine to a fluid paste also gives good results, but the space between the spindle and the handle should be somewhat more than when using the potassium silicate. Either cement should give you the desired results.—C. H. P.

CLEANING

Q.—I am sending you two machine bolts done at the same time and in the same basket. One was instantly thrown into cold water, the other was allowed to dry itself. I would like to do all this work without the use of water, but am unable to get a satisfactory finish. Can you offer any suggestions?

A.—Water is the very life of cleansing and plating. You cannot dispense with it no matter how you try. One-half of the difficulties experienced today in the drying of articles after plating is due to the use of sufficient water. Water is the natural solvent of all the metallic salts, alkalis and acids used in the process; without it nothing could be accomplished. the two bolts prove the difficulty you will experience in endeavoring to dispense with a wash water. The one clear and bright after washing; the other dull, dark and stained. Not only this, but after a time corrosion would take place, especially in a moist humid atmosphere. When the articles are left to dry spontaneously only the water is evaporated, the solids remain and you will find they will cause you lots of trouble. It is cheaper to use plenty of water than to have to cover the same ground twice at the cost of labor.—C. H. P.

COLORING

Q.—How can I obtain a chocolate brown on rough bronze castings?

A.—To produce this finish proceed as follows: After the castings have been freed from sand and gates removed, sand blast the castings if an even surface is required; if not, they should be acid dipped in a regular acid dip, the proportions for bronze castings should be:

Aqua fortis, 38 per cent	2 gals.
Oil of vitriol, 66 per cent	1 gal.
Muriatic acid	4 ozs.
Water	1 qt.

Mix up the acids and let them cool for several hours. In use the acid dips should be surrounded with cold water to reduce the temperature as much as possible. After the acid dip cleanse in potash and cyanide, then lightly scratch brush the surface. Recleanse as above, and then immerse the castings in a very hot liver of sulphur dip, consisting of not less than 4 ounces of liver of sulphur to each gallon of nearly boiling water. Immerse until quite dark, then remove, wash in cold water, then in boiling water and dry in sawdust.

Afterwards scratch brush the surface, dry and lacquer. If the tone is too dark, scratch brush the surface wet, using a little sal soda in the brushing water, which will lighten up the color. A little experimenting will give you the desired results. If the castings are a very light color it is sometimes necessary to copper plate them in the regular manner. If you should have to do this, use a cold liver of sulphur solution, using from ½ to 1 ounce to the gallon. The manipulations are the same.—C. H. P.

FINISHING

Q.—You would greatly oblige us by giving us a way of frosting iron belt buckles, similar to sample, with acid. We have tried hydrofluoric and other acids but have not obtained the desired result.

A.—The satin finish is produced upon the steel buckle by a deposit of iron. This deposit is very soft and has the appearance of a frosted finish. The deposit also being grayish in tone when relieved produces the effect of antique silver. To prepare the iron solution, saturate water with all the sal ammoniac it will absorb; then set up as a plating bath, but use a reversed current with a good voltage, place several soft iron anodes and cathodes on each connecting rod and set the bath working. The working of the bath should be continued until sufficient iron has been reduced to deposit freely; then change the polarity to a regular plating solution; use the sheet iron as anodes and deposit on the buckles for ten or fifteen minutes or until the surface is sufficiently frosted. Then finish the buckle as per sample. It would be advisable to lacquer the surface, although the sample does not appear to be lacquered, probably a little olive oil would answer the purpose.—C. H. P.

GILDING

Q.—Will you be good enough to let us know through the columns of your journal the best process for yellow gilding on steel chain?

A.—First it would be advisable to produce as bright a surface as possible; then give the articles a flash in a warm bright brass solution for a minute's duration. Now remove, wash and gild in the following yellow gold solution, consisting of:

Phosphate of soda	8 ozs.
Bisulphite of soda	1 oz.
Cyanide of potassium	6 dwts.
Neutral chloride of gold	6 dwts.
Water	1 gal.

The solution should be run at a temperature of 160 to 180 degrees with a platinum or 24 karat gold anode, or the two in combination. If a voltage not exceeding 2½ is used and the articles are manipulated while gilding, a pure yellow gold will be produced.—C. H. P.

LACQUERING

Q.—Can you give us a formula for producing a dead black finish on the inside of aluminum pans ¾ inch in diameter?

A.—The best way to accomplish what you require is to purchase a rubber finish black lacquer for aluminum, which may be obtained from any of the lacquer firms advertising in THE METAL INDUSTRY. The lacquer coating could be accomplished by covering the surface of the inside of the pans with the lacquer and then draining to remove the excess of lacquer. Afterwards the articles should be dried at a temperature of 120 to 160 degrees to produce the requisite hardness. The above method is the one used by aluminum goods manufacturers.—C. H. P.

PLATING

Q.—We have tried the formula for gun metal finish on brass given on page 291 of the September number of THE METAL INDUSTRY, but the result has not been satisfactory, as we have obtained a grayish tone. What can we do in order to obtain a bright black finish?

A.—If the solution referred to deposits a grayish tone of black nickel, it is due to the effect of too much current. The voltage should be from 2 to 3, and the amperage about 5 to a square foot of surface. A small amount of solution of sulphate of copper may be added to the bath, which will also produce a blacker tone, but care must be used in the addition or the deposit will become smoky in appearance.—C. H. P.

Q.—Can you give me a formula for silver or nickel plating on terrapin shells?

A.—Dissolve gutta percha clippings in benzole, producing a thin cement. It is advisable to filter through cheese cloth before using. Coat the shells evenly with a camel's or badger's hair brush, and while tacky rub in copper bronze powder, using a separate brush for the purpose. When dry and hard the surface is really for plating. This should be accomplished in the acid copper bath. After the deposit is heavy enough, the shells can be silver plated, nickel plated or gilt, as required.—C. H. P.

Q.—Please publish formula for a hard black finish suitable for automobile lamps, also the best method of replating old britannia ware?

A.—The hard black finish recently produced in automobile lamps is not a deposit, but is produced by first coating the metal with a japan by the spraying method used in lacquering. This may be an air drying or baking japan. When the surface becomes sufficiently hard the japanned surface is lacquered with a rubber finish lacquer. This is also sprayed, the lacquer partly imbeds itself in the japan, producing the excellent finish noted. Black nickel deposits of any description will not stand the atmosphere and must be lacquered for protection. A good black nickel solution consists of the following:

Double nickel salts	6 ozs.
Sal ammoniac	2 "
Sulpho-cyanide of potassium	2 "
Water	1 gal.

When the solution is prepared dissolve carbonate of copper in strong ammonia, then add two to four teaspoonfuls to each gallon of solution. Use a low current and anodes of sheet brass.

SPOTTING OUT

Q.—Will you please tell me through your valuable paper how to finish cast brass candle sticks (highly polished and brush brass finish) so that they will not spot out after lacquering?

A.—The only possible way to prevent spotting out of your work is to avoid cleansing by acids or alkalies, or procure castings that are entirely free from pin holes. We would suggest that you try all your cleansing operations with benzine or gasoline. Your brush brass work should be done with an old brass composition and tampico wheel instead of using pumice and water. If you follow this method your castings cannot possibly spot out, because nothing would be absorbed that could possibly come to the surface. The old brass composition can be obtained from the concerns manufacturing polishing materials, whose advertisements appear in THE METAL INDUSTRY.—C. H. P.

STRIPPING

Q.—Can you tell me how to remove silverplating from copper and brass work?

A.—Nitric and muriatic acids together attack the copper more than the silver. The following mixture will remove the silver with little action upon the copper or brass:

Sulphuric acid, 66 degrees Baumé	16 ozs.
Nitric acid, 36 degrees Baumé	4 ozs.

Prepare the silver strip by adding the nitric acid to the sulphuric acid, then secure the articles by soft copper or brass wire and immerse them in the strip, remove the articles occasionally to see how the stripping is progressing. Use care not to add any water to the acids. In the event you wish to wash the articles in water, then dry them before reimmersing in the acids. The action of the above mixture is slow, but sure.—C. H. P.

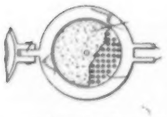
PATENTS

REVIEW OF CURRENT PATENTS OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

999,895. August 8, 1911. Filtering Device. W. J. Smart, New York, N. Y.

An invention relating to filtering devices generally, but is especially adapted for use in the filtering of gases or vapors, such, for instance, as compressed air, or in fact all gases where it is desirable to free the same from foreign material such as moisture, water, oil or other liquids, dust, dirt or impurities of all kinds.

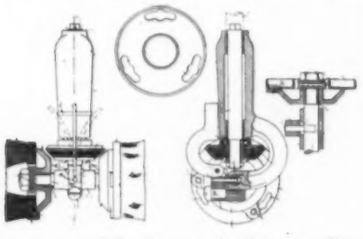
It is especially adapted for use in all cases where compressed air is employed, including hospital and physicians' service for spraying, or where compressed air is used in the finishing of manufactured articles with lacquer, paint enamel, japan, bronze, or other liquid materials in an atomized state, where any impurities or foreign material will be detrimental.



In compressing air there is always a condensation of moisture from the atmosphere and of the oil vapor which is generated by the heat of compression in the cylinder. Under service conditions it is also practically impossible to obtain a supply of air which is completely free from foreign matter and impurities and it is one object of this invention to provide at some point near the place of utilization a filtering apparatus shown in cut which shall completely absorb or remove from the air or gas employed, all entrained moisture or other impurities.

1,000,458. August 15, 1911. Cleaning and Polishing Device. J. E. S. Taylor, Highland Park, Mich., assignor of one-half to R. M. Mackenzie, Detroit, Mich.

An invention relating to cleaning and polishing devices and its object is a cheap and efficient device for the purpose of cleaning and polishing, operated by power, and adapted to be carried about by hand within a limited space determined by the length of a flexible connection to a source of power, such as an electric motor. The motor may be arranged to ride on a track and thereby enable the device to be used over a considerable space as might be required in a mill or factory for the cleaning of castings and the like that are too heavy to be moved by hand.



The machine shown in cut consists, principally, of a pair of buffing wheels rotably mounted on a shaft, either of which may be brought into rotative engageegent with a drive wheel. One of the buffing wheels is to be used as a cleaner and the other as a polisher and when one wheel is in use the other remains stationary.

1,001,497. August 22, 1911. Composition of Matter Containing Alumina and Magnesia. Thos. B. Allen, Niagara Falls, New York. Assignor to the Carborundum Company, Niagara Falls, N. Y.

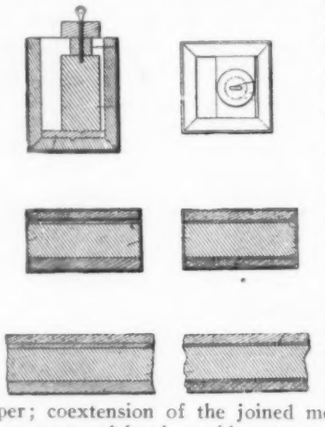
An invention that is designed to provide a new and useful composition of matter containing oxides of aluminum and magnesium. The composition is of a crystalline nature, and forms abrasive grains which are valuable especially for grinding such materials as soft metals, metallic alloys, leather, wood, etc.

As the preferred process gives the product a molten condition, it may be cast into any desired shape and used for refractory or other purposes. The product consists essentially of alumina and magnesia, with not over 25 per cent. of magnesia; and the product may be varied in hardness and toughness by changing the magnesia content.

In preparing the improved product, it is preferable to use an electric furnace to melt the mixture of oxide of aluminum and oxide of magnesium. A suitable furnace for this operation is an electric arc furnace with vertical electrodes depending into the furnace pot or crucible, such as shown in United States Letters Patent No. 929,517, granted to Frank J. Tone, on July 27, 1909.

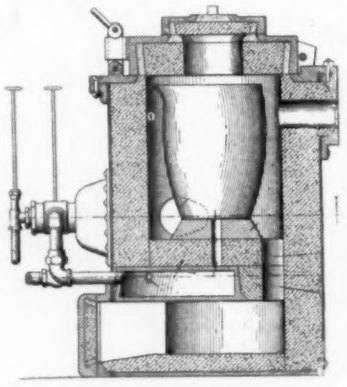
1,001,669. August 29, 1911. Compound Metal Body and Process of Making the Same. J. F. Monnot, New York, N. Y. Assignor to Duplex Metal Company, New York, N. Y.

This invention relates to compound metals and processes of producing the same, and comprises a body of metal having a layer or facing of copper or cupriferous metal on the one side and a layer or facing of noble metal, such as silver or gold on the other with an intervening and reinforcing layer of a stronger ferrous metal between, firmly and permanently united to said other layers, as shown in cut; and the invention also comprises a process of producing such compound metal bodies comprising the coating of a ferrous metal billet or plate with a cohering welded-on layer of copper; coextension of the joined metals to form a plate and to compact and harden said copper, and union of a layer of noble metal to the copper on one side of said plate.



1,001,696. August 29, 1911. Crucible Furnace. E. H. Schwartz, Chicago, Ill. Assignor to Kroeschell Brothers Company, Chicago, Ill.

This furnace shown in cut is an improvement in the class of crucible furnaces in which the fuel (gas or oil) and the air for promoting its combustion are introduced into the furnace-chamber at or near its base and the hot gases of combustion are given a gyratory motion in ascending to cause them to envelop the crucible supported in the chamber, for heating it to melt its contents.



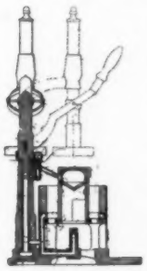
The casing is built, as usual, of refractory material sheathed with metal, and contains a seat for a crucible; and it is provided with a hinged brick-lined cover. The fuel-supply is introduced into the bottom part of the furnace-chamber at a port extending tangential to the chamber through its wall from a protuberance thereon, at which it communicates with a nozzle-device comprising a casing forming a chamber having an outlet registering centrally with the inlet-end of the port and containing a nozzle supported on the outer end of the casing, where it contains a chamber, from which extends the central bore of the nozzle to register with the outlet, and into which a plurality of forwardly-converging ducts lead from the chamber in the casing which surrounds the nozzle. The gas or oil supply-nozzle is supported to project into the chamber and discharge centrally into the adjacent end of the nozzle-bore, and it extends from a needle-valve device for controlling the supply to the furnace of the fuel through a pipe. Air is ad-

mitted through the furnace-wall into the crucible-chamber to discharge into the path therein of the gyrating gases and enhance their combustion.

1,001,005. August 22, 1911. Apparatus for Casting Metal Under Pressure. Sekiichi Enmoto, Tokyo, Japan.

The apparatus shown in cut is designed for the casting of precious and light metals, such as gold, silver, or aluminum, and is particularly designed for small work and where accuracy and high finish are desired.

One of the objects of the invention is to provide an apparatus whereby the molten metal is forced into the mold cavity under pressure.



One of the claims covered in the patent is for: An apparatus for casting light and precious metals comprising in combination, a flask having a metal supporting portion with widely diverging metal supporting walls arranged to expose the top and sides of the metal thereon, and a cap covering the metal and provided with an interior heat reflecting surface acting upon the exposed portions of the metal, and means for projecting a flame into said cap to fuse the metal.

1,003,659. September 19, 1911. Electroplating of Wire Cloth. F. J. Root, New York, N. Y. Assignor to New York Wire Cloth Company, New York, N. Y.

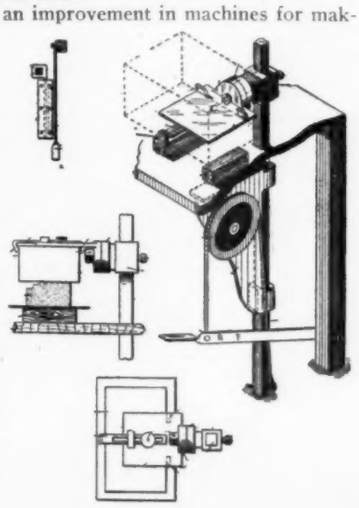
This patent covers the process and method used in the manufacturing of electroplated wire cloth which consists in passing in a continuous path a long strip of woven wire cloth alternately over and under upper and lower rollers, as shown in cut, and electrically depositing the plating material upon the cloth while in the bath within which the lower rollers are located, the upper rollers being located above the bath whereby the portion of the cloth passing over the upper rollers will be out of the bath.

Two claims of the inventor are as follows: In the manufacture of wire cloth the passing of a long wide strip of woven cloth or screening alternately in and out of a bath over lower and upper sets of guiding means located respectively in and above the bath and while the work is in transit in the bath electrically depositing plating material thereupon from anodes located between the folds of the work.

In the manufacture of wire cloth the passing of a long strip of cloth through an electroplating bath in the presence of anodes composed of the plating metal located between adjacent layers of the cloth and simultaneously with the passing of the cloth through the bath sending an electric current to the anodes and leading said current from the cloth at a plurality of places along the path of its travel.

1,003,755. September 19, 1911. Core and Core-Making Machine. A. M. Kelly, Detroit. Mich.

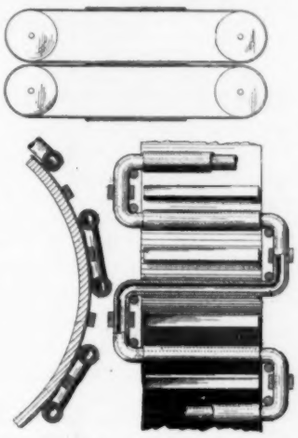
This invention relates to an improvement in machines for making cores, shown in the accompanying drawing and more particularly pointed out in the following specification and claims.



The object of the invention is to provide a machine of the bench type adapted for making cores or small molds, by the use of which the sand may be tamped in the core box—the box then reversed and subsequently lifted, leaving the core upon a facing plate (placed over the core box before reversing it) whereby it may be removed from the machine.

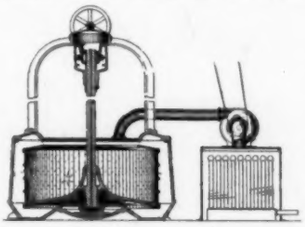
1,003,799. September 19, 1911. Process for the Electrolytic Deposit of Metals. Armin Rodick, Milan, Italy.

This patent covers the method of electrolytically forming articles, which consists in successively depositing given quantities of metal on one portion of a moving cathode, as shown in cut; forming the desired article by simultaneously and successively plating out the same said quantities of metal from another portion of said cathode; and in suitably moving said article relatively to said cathode during the plating operation; and the method of electrolytically forming hollow articles, which consists in successively depositing given quantities of metal on one portion of a moving cathode; forming the desired article by simultaneously and successively plating out the same said quantities of metal from another portion of said cathode; in suitably moving said article relatively to said cathode during the plating operation; and in simultaneously depositing metal on the interior of said article.



1,003,827. September 19, 1911. Art of Drying and Polishing. F. A. Tolhurst, New York, N. Y. Assignor to Tolhurst Machine Works, of Troy, N. Y.

This machine shown in cut dries and brightens acid-dipped and electro-plated metal articles with great rapidity, is capable of acting at one time on exceeding large quantities of such articles to simultaneously brighten and dry them, even when such articles are of elaborate form, and will accomplish the work at a very low cost. According to the present invention a mass of the metal articles are taken wet from the cleaning or electrolytic bath and are subjected to the act of a blast or current of hot, dry air moving at great velocity, and in accordance with one feature of the invention, the mass of articles is at the same time moved in a transverse direction to the direction of movement of the current of air, and also preferably at a high velocity.



The articles are thus dried and at the same time brightened, or rendered lustrous to a very high degree, giving them a pleasing, satisfactory and superior commercial finish. Both the drying and brightening action is accomplishing by the action of rapidly moving air currents, and not by any attrition due to movement of the articles in the mass either against or relatively to each other, or against any other substance. In fact, with most such articles, it is essential that they be at rest relatively to each other individually, as they would otherwise be scratched and abraded so as to be uncommercial.

1,002,258. September 15, 1911. Appliance for Producing Articles by Electrodeposition. F. F. Gibbs, Birmingham, England.

1,002,658. September 5, 1911. Method of Treating Molds Used in the Art of Electrotyping. G. E. Dunton, New York, N. Y.

1,002,889. September 12, 1911. Process of Metal-Casting. H. L. Whittemore, Urbana, Ill.

1,002,941. September 12, 1911. Clamp for Brazing or Similar Work. C. R. Sturdevant, Worcester, Mass., assignor to the American Steel and Wire Company, Hoboken, N. J.

1,003,957. September 19, 1911. Casing Construction for Pin-Cylinder Locks. H. G. Voight, New Britain Conn., assignor to Russel and Erwin Manufacturing Company, New Britain, Conn.

INDUSTRIAL

NEW AND USEFUL DEVICES, MACHINERY AND SUPPLIES OF INTEREST TO THE READERS OF THE METAL INDUSTRY.

20-INCH MOTOR-DRIVEN SHEET AND STRIP ROLLING MILL INSTALLATION

A Description of a New Sheet Metal Rolling Mill Established in Philadelphia, Pa.

The Philadelphia Roll and Machine Company, Philadelphia, Pa., have recently completed and installed at the plant of Shimer, McGlynn and Company, Philadelphia, Pa., a motor driven 20-inch sheet and strip mill, and also a 12-inch rod mill, both of which present a number of features that will undoubtedly prove interesting to everyone connected with the rolling of metals. The sheet mill consists of one stand 20 inches by 36 inches two-high roughing mill and one stand 20 inches by 30 inches two-high finishing mill, and a set of two-high pinions complete. This mill is of the usual counterbalanced type with the exception of the adjusting gearing. This adjusting gearing consists of a lever adjusting disc, which is secured to the top of the screw by keys, and serves as a means of backing up the screws in case of stalls. The bevel gear wheel is fitted into this adjusting disc with male and female joint, and is held in place by means of a securing plate which clamps it fast in any desired position. This securing plate is fastened to the adjusting disc, and also holds the horizontal shaft and chair in position. The bevel gear and adjusting disc are also provided with pin holes as shown, for use in case it is desired to secure them in one relative position. This arrangement allows unrestricted separate adjustment of either screw to any desired degree, and thus overcomes one of the principal objections to the bevel gear type of adjusting rig. A detailed drawing of this device is shown in Fig. 2, and its operation and advantages will at once be apparent. One of these advantages which will commend itself to practical rolling mill men is the cheap replacement of all wearing parts wherever necessary. Another striking feature of the mill which is shown plainly in the photograph Fig. 1, is its particularly compact and strong design.

One of the principal products of Shimer, McGlynn and Company is cold rolled planished Monel Metal sheets and strips, as well as finished rods and wire of the same material. This metal hot rolled has been offered on the market for sometime past, but owing to the difficulties connected with its manufacture has never previously been successfully cold rolled. It is an absolutely non-corrosive metal, very ductile, and is 33 per cent. stronger than steel. The crushing strength of Monel Metal during and after cold rolling is extremely high, and for the production of cold rolled sheets an unusually strong and substantial mill is necessary. The mill shown was especially designed for this purpose, particularly generous provision having been made for the lubrication of the roll and pinion necks on account of the great pressure which has to be exerted on the metal during rolling. The 12-inch mill is an ordinary three-high type mill, equipped with especially designed rolls for the cold rolling of Monel Metal bars and rods, as well as with ordinary rolls for the usual alloys. On account of the different metals which it is desired to roll on this mill it is necessarily operated at two speeds, selective change gears having been provided for this purpose. The method of operating these change gears is clearly shown in Fig. 3, which is a plan view of the complete drive. Both selective gears are shown in mesh in this illustration, which is taken from a drawing used in erecting. It is clearly apparent that when both gears are slipped out of mesh the 12-inch mill is idle. The desired size of gear can then

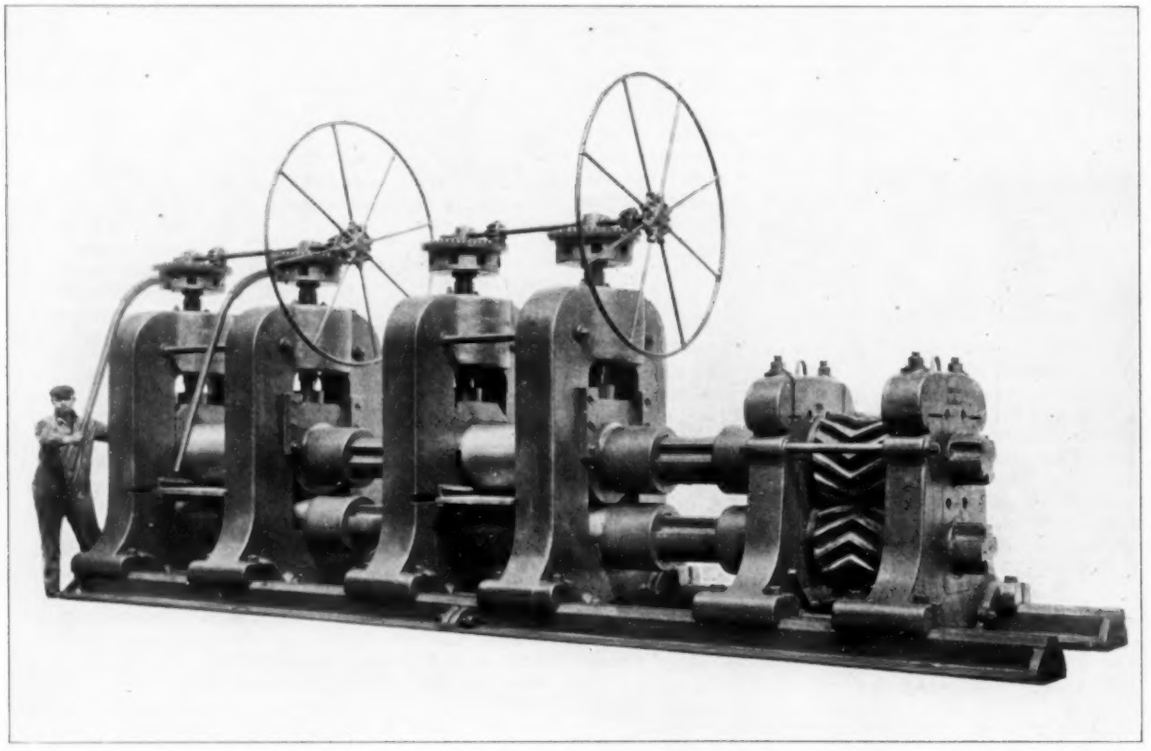


FIG. 1. THE 20-INCH MOTOR-DRIVEN SHEET AND STRIP ROLLING MILL INSTALLED FOR SHIMER, McGLYNN AND COMPANY, BY THE PHILADELPHIA ROLL AND MACHINE COMPANY, PHILADELPHIA, PA.

be slipped into place and the split spacing sleeve bolted into the vacant space, thus providing a substantial and strong varying speed drive.

The 12-inch mill stands at right angles to the 20-inch mill and main gear drive, and is driven by means of bevel gears and the change gearing described. The entire installation is motor driven, 200 horsepower, 220 volts, 375 amperes General Electric Company's Induction motor being used. Westinghouse type S transformers are used to reduce the current which is supplied at 2,200 volts down to 220 volts. The transformer house is located in the same building, but about 100 feet away from the motor. A drop of ¼ volt takes place in this distance. Current consumption is measured by standard 600 ampere wattmeters. On account of existing conditions, readings have not yet been taken of the power requirements of the different metals while rolling. The speed of the motor is 650 R. P. M. The secondary shaft runs 143 R. P. M. The 12-inch mill runs at either 143 R. P. M. or 47⅔ R. P. M. and the 20-inch mill at 28 R. P. M. Speed reductions on the main drive are effected through two sets of gears. The first set are cast steel with cut teeth, the second set being cast gears made of special air furnace iron gear metal, which is known for its strength and wearing qualities.

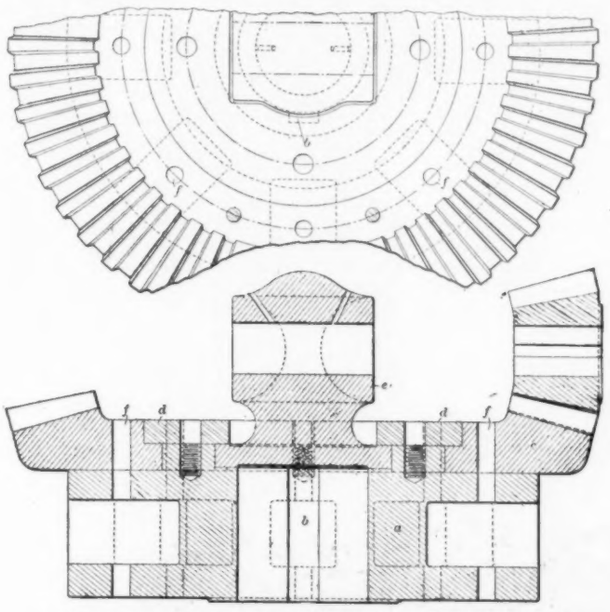


FIG. 2. SKETCH OF THE ADJUSTABLE GEARING.

The secondary shaft of the gear drive is provided with an 8-foot diameter fly-wheel weighing 12,500 pounds and having a rim speed of practically 3,600 feet per minute. This fly-wheel was designed to equalize the motor load and experience has proven that its Kinetic energy is sufficient to complete the rolling of any ordinary bar through the 20-inch mill even though the power be cut off at the instant the bar enters the rolls. Everything in connection with the rolling mills and drive have been designed especially strong and heavy in view of the character of the metal to be rolled.

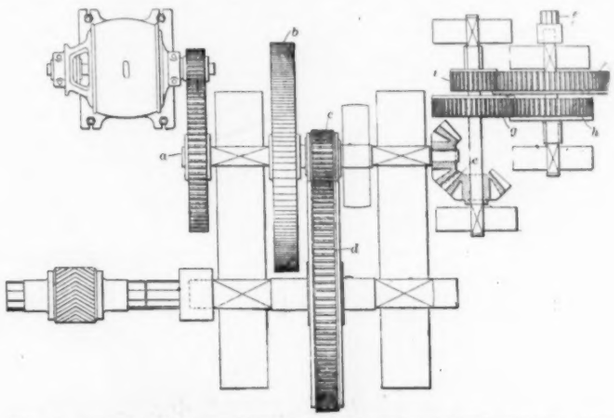


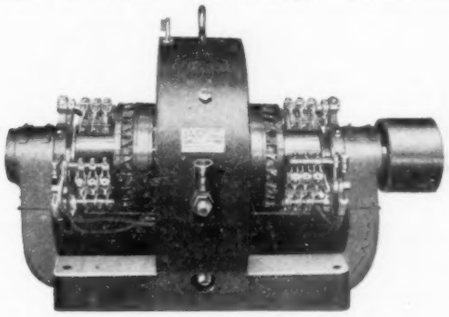
FIG. 3. PLAN VIEW SHOWING HOW THE CHANGE GEARS ARE WORKED.

Shimer, McGlynn and Company now claim to be able to furnish Monel Metal with a finish equal in every way to the best German silver. This is a very creditable achievement and when the remarkable strength and other properties of the metal are considered, it would seem that a new field had been created for the non ferrous alloys.

The design and installation of the mills and rolls illustrated above were made under the supervision and direction of Wm. P. McGlynn, general manager of Shimer, McGlynn and Company, and the special features and improvements are such as have been suggested as a result of his extensive experience along similar lines.

EXCEL-ALL DYNAMOS

The new line of plating and electrotyping dynamos recently placed upon the market by The Bennett-O'Connell Company of Chicago, Ill., contain some new features of merit, as well as some of the latest features in electrical engineering. The main feature of this dynamo lies in the brush and brush holder, which is a radical departure in plating dynamo construction. They have adopted what is known as a radial type of brush holder and brush, shown in the accompanying cuts, which allows the brush to rest radially upon the commutator, the brush being actuated by a tension finger, which keeps the brush in contact with the commutator at all times, thereby overcoming the great objection to the old type of copper leaf or woven wire gauze brushes in that when they wear down the brush gradually shifts back off the point of commutation, which, heretofore, has required considerable time and trouble in retrimming and resetting of the brushes. This is claimed to be entirely overcome by their radial brush holder. The accompanying cuts will give the reader a practical view of this holder and brush and its position on the commutator as used on their line of dynamos.



THE EXCEL-ALL DYNAMO.

The brush used in connection with this brush holder is a composition brush with a very high conductivity, which is guaranteed to commutate 150 amperes per square inch of contact. This brush requires no lubrication on the commutator whatever, neither does it require any retrimming or resetting,

RADIAL BRUSH HOLDER.

which brings this line of dynamos up to the standard practices of standard lighting dynamos and power motors. In general design they have adopted the well known round type of dynamo frame, being made of cast iron with steel blocks cast, welded and bolted in the same.

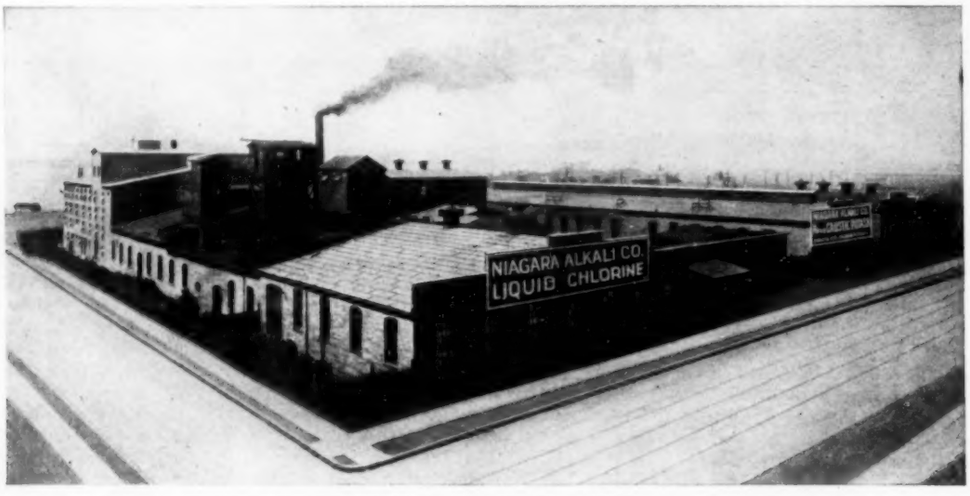
The armatures are bar wound, thoroughly ventilated radially and longitudinally. The commutators are made of tempered copper, thoroughly insulated with mica insulations, and are also ventilated parallel with the shaft. In fact, the combined outfit is so designed to take care of the heavy duty that plating dynamos are called upon to perform.

These dynamos are guaranteed to have a rise in temperature not to exceed that allowed by electrical engineers for standard dynamos and motors after a full load run of ten hours. This brings this line of dynamos up to every modern practice in standard dynamo and motor building.

These dynamos are built in sizes from 150 to 3,500 amperes, and are either belted or motor driven, shunt or compound wound.

ELECTROLYTIC CAUSTIC POTASH

The subject of potash for cleaning metals being of so much importance to our many readers, one of our representatives took the opportunity to stop off on his return from a recent western trip to interview the Niagara Alkali Company, the only American manufacturers of electrolytic caustic potash. He found that this company has succeeded the old Roberts Chemical Company, which was installed in a small plant at the corner of Union street and Buffalo avenue, in the city of Niagara Falls, N. Y., for a number of years and which made such a reputation among the plating trade as furnishers of Roberts electrolytic caustic potash in solid, broken and liquid form.



THE PLANT OF THE NIAGARA ALKALI COMPANY, NIAGARA FALLS, N. Y.

We find that the old plant has been entirely removed and a new up-to-date plant of twelve times the capacity has taken its place, as shown in the illustration. Our representative was shown the entire plant by the secretary of the company, and the company asserts that they can supply the entire American consumption of caustic potash. Their transformer station of steel and concrete fireproof construction contains a complete duplicate outfit of transformers and rotary converters, and a very impressive comparison is here obtainable between the old and the new from the fact that the old machinery formerly used by the Roberts Chemical Company is located in one corner of this room as a keepsake, being about the only part of the old plant left.

The electrolytic department where the muriate of potassium is converted into caustic potash is located in a building about four times the size of the old plant and is a delight to the beholder. Here they have in operation a battery of the most improved type of electrolytic cells in existence, the most impressive thing about the entire apparatus being its extreme simplicity and ease of operation. In this operation they are producing caustic potash liquor, chlorine and hydrogen gas. The weak liquor produced is conducted to the adjacent building, where is installed a full system of Zaremba evaporators working in triple effect. Here the weak liquor is evaporated to strong liquor or Roberts liquid potash. This is placed in the well-known steel drums for storage and shipment to such of their customers as use liquid in drums; or for shipment in tank cars to the tank car customers; or stored in strong liquor tanks.

From the latter the strong liquor is taken to the kettles where it is evaporated until the water is all driven off, leaving the high grade 90 per cent. caustic potash, the use of which has given satisfaction to so many old and new customers of this company. This molten or fused potash is then ladled into steel drums for shipment or into the pans of the casting elevator where, after cooling, it is passed through crushers and mills to produce broken and granulated caustic potash. These four forms, liquid, solid, broken and granulated are packed in various size containers to suit the requirements of customers. Only the 90 per cent. goods are labeled with their trade mark, which affords a heretofore unobtainable protection to the buyer, in that he is guaranteed to get 90 per cent. caustic potash when it bears the "NIAGALK" trade mark. They also make all of the grades between 45 per cent. and 90 per cent., as desired by their trade, but prefer to ship only the pure material.

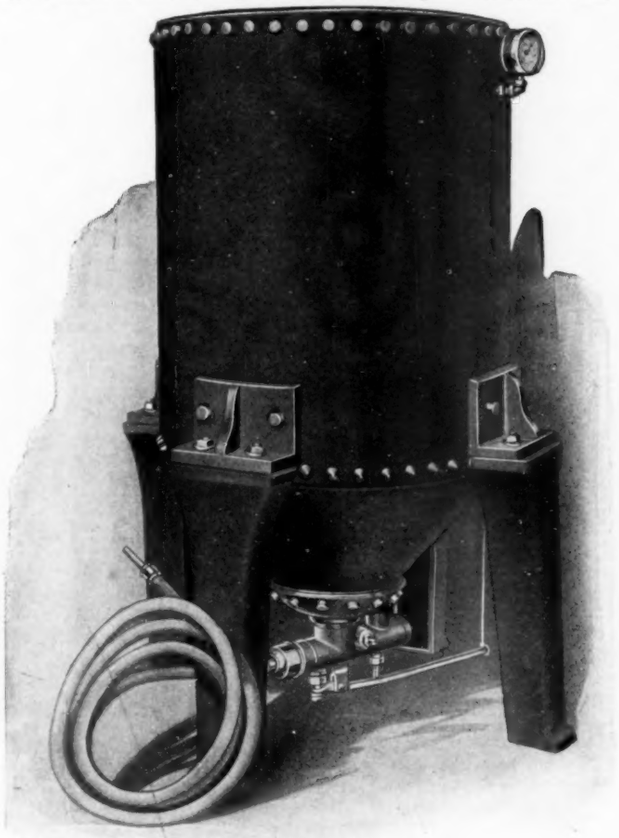
The hydrogen gas and a portion of the chlorine gas are conducted to a furnace for the synthetic manufacture of muriatic acid by direct combustion of hydrogen and chlorine, this firm saying they are the only concern in the world manufacturing muriatic acid in this way. Another portion of the chlorine gas is made into carbon tetra chloride and still another into high test bleaching powder, and the remaining chlorine gas is delivered to the Electro Bleaching Gas Company, who liquefy same and sell to the bleaching trade in all lines, packed in 100 pound steel cylinders under an enormous pressure.

The company issues a descriptive pamphlet of their products which can be had on application. They record their progress in production by stating that in 1909 they produced 500,000 pounds of caustic potash and by the end of 1911 they will have manufactured this year 6,000,000 pounds. The officers of the company are H. D. Ruhm, president and general manager; E. M. Sergeant, vice-president and assistant general manager; F. O. Geyler, secretary and treasurer.

THE MOTT SAND BLAST

The accompanying cut shows a Mott automatic sand blast machine, which is manufactured by the Mott Automatic Sand Blast Manufacturing Company of Chicago, Ill. This apparatus can be regulated to work under any desired pressure and the manufacturers guarantee that an economy of fifty per cent. can be effected by the use of this sand blast, while at the same time, it will do higher grade work than any other sand blast now on the market. One of the principal features about this sand blast is

the fact that there are no pipes to clog, no valves to cut out, and it can blast at a distance and still retain the pressure. It can also be operated with two leads of hose. It is said that one man can clean from ten to sixty tons of castings per day, according to the size. Any type of air compressor may be used in connection with this apparatus; the machine has been designed for pressure between 30 and 125 pounds per square inch. If the machine is used in a foundry not supplied with an air compressor and it is not desired to install one, the sand blast may be connected with



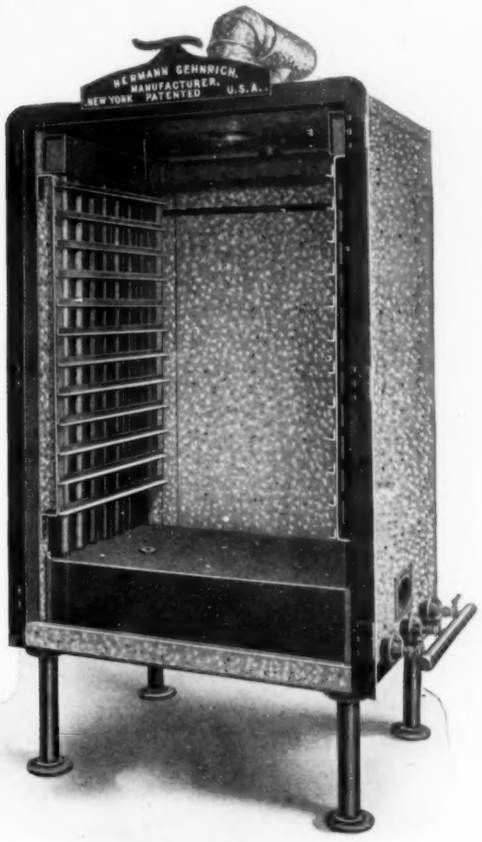
THE MOTT SAND BLAST.

a cupola blower as the manufacturers say it may be operated successfully on a blower pressure of from five pounds upwards. The sand blast is sent on ten days' trial to any responsible party and may be returned at the expense of the manufacturers if it does not substantiate the claims made for it.

GEHNRICH INDIRECT HEAT RADIATOR OVENS

Hermann Gehnrich, of New York, has put upon the market the radiator oven shown in cut, which he says is filling a long felt want for an indirect gas-heated oven with greatest efficiency. For japanning and lacquering and drying out all material containing combustible fumes, this oven has many advantages over the open burner type ovens and space ovens. The open burner oven is preferred for many classes of work, such as drying out molds and core baking, and in some cases used for japanning. But as a japanning oven or for drying out material containing combustible fumes it does not meet the requirements of the board of fire underwriters. The board requires that the baking compartment must be entirely independent of the gas or heating chamber, so that no fumes can enter same. Space ovens have been built and are now being made by some manufacturers to meet the requirements of the board of fire underwriters, but they too have their disadvantages as to efficiency in comparison with our radiator oven. A space oven is one in which a sheet iron box is set inside of an asbestos lined oven with a space all around sides and top which forms a separate baking compartment. This space as a rule is two inches. The heat from the gas or heating chamber passes up between the asbestos walls and the baking compartment. The result is that the outside walls of the oven are also being heated, and only part of the heat is radiating into the baking compartment. This method increases the radiation of heat from the walls on the outside of the oven, and it requires more gas and time to raise the heat in the baking compartment to the required temperature.

The radiator oven Mr. Gehnrich claims overcomes all these disadvantages and meets every requirement of the board of fire underwriters. The burners of this oven are entirely inclosed in a heavy sheet metal chamber which is connected with a series of flues or "radiators" that lead into ducts at the top which are connected with the outside flue. The gas fumes cannot enter the oven. The radiators are in the baking compartment. The heat in passing from the heating chamber to the ducts at the top radiates from all sides of the flues or radiators, and the full heat goes into the baking compartment. The asbestos walls are not heated any more than from the temperature of the baking compartment. The flues of the radiators are made of 2 inch sheet iron pipes, and are spaced from 1½ inch to 2 inches apart, the space between allowing for the circulation of heat and the unobstructed passage of fumes and smoke from the japanning into the outside flue. This cannot be had in a space oven unless the angle iron racks are set off from the wall which means reducing the width of oven.



THE GEHNRICH OVEN.

Another feature of the radiator oven is the system of taking in air for the circulation of heat and driving out the smoke and fumes of the japan from the baking compartment. The radiators are placed on two sides of the ovens. In the smaller or closet type ovens the burners are placed in the center of the base and the burners are operated from the side. In the larger or standard type ovens a burner chamber is placed along the two sides and the burners are operated from the rear. They can be made to operate from the front if desired. The center of the standard type ovens are free to walk on. A baffle plate made of 3½ inches x ⅜ inch is placed over all burners, which increases the heat units. Full information regarding the oven may be had by addressing Hermann Gehnrich, 518 Water street, New York.

ITEMS OF INTEREST TO THE INDIVIDUAL.

W. R. Dean, formerly foundry foreman for Peck Brothers Company, of New Haven, Conn., has accepted a position in a similar capacity with the Hyde-Windsor Company, Bath, Me.

N. K. B. Patch, manager of the Lumen Bearing Company's Toronto plant, has been suffering severely from throat trouble, but has now recovered and is able to attend to business.

C. R. Vincent, for many years president of the Ball & Wood Company, has assumed the managership of the Monel metal department of the Ruggles-Coles Engineering Company, 50 Church street, New York, general agents for the Bayonne Casting Company, Bayonne, N. J.

E. J. Woodison, formerly president of the Detroit Foundry Supply Company, of Detroit, Mich., has recently become the Detroit representative of the Bennett-O'Connell Company, platers' and polishers' supplies, Chicago, Ill.

Charles A. Buckley, who was recently elected treasurer of the Ames Sword Company, manufacturers of endless sewed polishing belt, Chicopee, Mass., has now been connected with that company for thirty-six years. Mr. Buckley rose steadily from the ranks, being appointed factory foreman in 1886 and superintendent in 1896. He has also held several prominent civic positions, having been Mayor of Chicopee in 1904.

James A. Doughty, who has been a leading figure in the brass manufacturing business for many years, on September 29, resigned as vice-president of the Coe Brass Manufacturing Company, Torrington, Conn. Mr. Doughty has been connected with that concern for twenty-five years and his retirement is due to ill health. George H. Turner, who has been secretary of the company, was elected to succeed Mr. Doughty, while Elisha J. Steele, who has been treasurer, has been appointed to the vacancy in the secretaryship. George E. Cole is the new treasurer of the company.

DEATHS

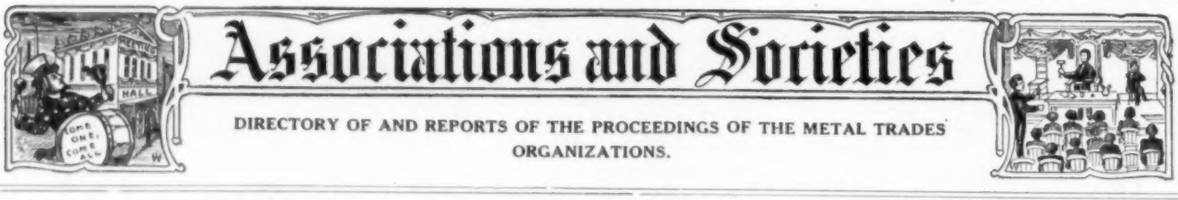
FRANK N. LOOK

FRANK N. LOOK.

Frank N. Look, the treasurer and manager of the Florence Manufacturing Company, Florence, Mass., died suddenly at his home on the morning of September 9. Mr. Look was born in Leominster, March 22, 1855, and went to Northampton in 1870. Seven years later he graduated from Amherst College and then entered the employ of the Florence Manufacturing Company. On the death of G. A. Burr, the manager of the Florence company, whose daughter Mr. Look married, he became manager, and it was largely due to his efforts that the business grew so rapidly. Mr. Look was greatly interested in municipal affairs and in the social life of the community, being director in several local institutions and was a member of several social organizations. His only surviving relatives are his wife, daughter and sister.

Thomas P. Kelly, of T. P. Kelly & Company, New York, died Friday, September 22.

Joseph L. Gobeille, who for the past three years has been at the head of the Gobeille-Harris Pattern Company, Niagara Falls, N. Y., died September 27, after a short illness, at the age of 55 years.



DIRECTORY OF AND REPORTS OF THE PROCEEDINGS OF THE METAL TRADES ORGANIZATIONS.

AMERICAN SOCIETY FOR TESTING MATERIALS

President, Henry M. Howe, New York; secretary-treasurer Edgar Marburg, University of Pennsylvania, Philadelphia, Pa., to whom all correspondence should be addressed. The society is affiliated with the International Association for Testing Materials and is a corporation formed for the promotion of Knowledge of the Materials of Engineering and the Standardization of Specifications and the Methods of Testing. Meets annually, the time and place being fixed by the Executive Committee.

Secretary Marburg reports, as a result of a letter ballot, that the standard specifications for copper, spelter and manganese bronze ingots,* as proposed at the Atlantic City meeting in June have been approved.

Bulletin No. 1 has been issued by the Organizing Committee of the American Society for Testing Materials for the Sixth Congress of the International Association for Testing Materials to be held in the Engineering Societies Bldg., New York City, in September, 1912. The officers of the above committee are as follows: Henry M. Howe, president, Bedford Hills, N. Y.; Robert W. Lesley, vice-president, Pennsylvania Building, Philadelphia, Pa.; H. F. J. Potter, secretary, 1 Madison avenue, New York; Edgar Marburg, treasurer, University of Pennsylvania, Philadelphia, Pa.

Several special committees have been appointed to be added to the Organizing Committee and an Executive Committee has been constituted as follows, the members consisting of the officers of the Organizing Committee and the chairmen of the special committees: Henry M. Howe, chairman; Robert W. Lesley, vice-chairman; H. F. J. Porter, secretary; Edgar Marburg, F. E. Schmitt, F. H. Clark, Richard L. Humphrey, Rudolph Hering, Joseph A. Holmes, Robert W. Hunt. The membership of the special committees is as follows:

FINANCE.—Edgar Marburg, chairman, University of Pennsylvania, Philadelphia; W. A. Bostwick, E. M. Hagar, John McLeod, R. S. Perry, A. A. Stevenson.

RECEPTION.—Robert W. Hunt, chairman, The Rookery, Chicago; John Birkinbine, Mansfield Merriman, C. C. Schneider.

*THE METAL INDUSTRY, July, 1911.

PAPERS.—F. E. Schmitt, chairman, Engineering News, 220 Broadway, New York; William K. Hatt, George F. Swain, Arthur N. Talbot, F. E. Turneaure.

TRANSPORTATION.—F. H. Clark, chairman, B. & O. Railroad, Baltimore, Md.; E. B. Ashby, Charles S. Churchill, Theodore N. Ely, J. P. Snow.

INFORMATION.—Richard L. Humphrey, chairman, 805 Harrison street, Philadelphia; Jesse J. Shuman, Gustav W. Thompson, John C. Trautwine, Jr., George S. Webster.

LOCAL COMMITTEE.—New York—Rudolph Hering, chairman, 170 Broadway, New York; George F. Kunz, Richard Moldenke, W. O. Wiley. Washington—Joseph A. Holmes, chairman, Bureau of Mines, Washington, D. C.; William H. Bixby, Allerton S. Cushman, Logan Waller Page, S. W. Stratton, Charles E. Munroe, Harvey W. Wiley.

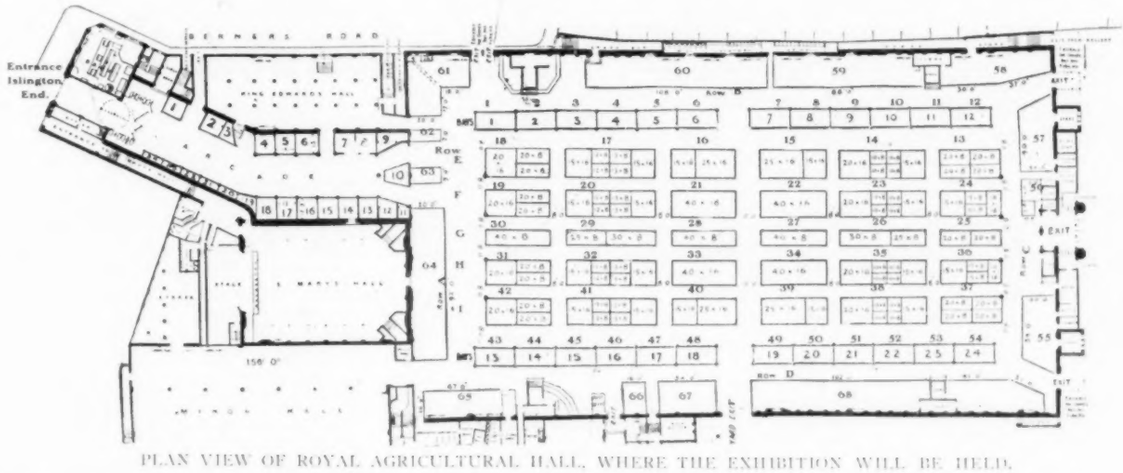
At the coming congress, as at previous ones, the sections will be separately dealt with in three sets of parallel sections. Section A deals with metals; Section B, with stone, cement and artificial stone, and Section C, with miscellaneous materials. The sectional sessions of the congress will give first consideration to the subjects of reports and discussion formulated by the council. There are two classes of subjects: 1. Principal questions. These number fifteen and each has been assigned to an authority on the subject matter of the question as reporter. The reporter will present a summary of present knowledge concerning the question. 2. Technical problems, of which there are about forty. Most of these have been assigned to committees international in composition and scope. The above two classes of subjects, lists of which are to be found in the Year Book, are open for the submission of papers independent of the reporters' views or the committee reports. Papers are not expected to exceed 2,500 to 3,000 words. All papers prepared in the United States should be sent to F. E. Schmitt, chairman of the Committee on Papers, 220 Broadway, New York, by January 1, 1912, in order that they may reach the general secretary in Vienna by February 1, 1912.

AN INTERNATIONAL EXHIBITION OF METALS TO BE HELD IN ENGLAND, IN 1912

An international exhibition of metals and their application for manufacturing and engineering purposes will be held at the Royal Agricultural Hall, Islington, London, N., on May 6 to 18, 1912. This exhibition, which will be the first of its kind ever held in the world, is attracting already world-wide interest. The preliminary prospectus just issued gives the following list of officers whose prominence in the metal world ensure success of the undertaking:

President, Sir Gerard Albert Muntz, president of the Institute of Metals. Vice-presidents, the following, who are also officers and members of Council of the Institute of Metals: Leonard Archbutt, T. A. Bayliss, G. A. Boeddicker, Prof. H. C. H. Carpenter, Prof. William Gowland, Sir Robert A. Hadfield, George Hughes, Sir C. A. Parsons, Prof. Thomas Turner, Sir William H. White, Sir Henry A. Wiggin. A council has also been appointed which includes the names of men prominent in manufacturing, mining and marine circles.

A plan is here shown of the Royal Agricultural Hall where the exhibition will be held and by it an idea may be gained as to the amount of space that will be utilized.



PLAN VIEW OF ROYAL AGRICULTURAL HALL, WHERE THE EXHIBITION WILL BE HELD.

The following list of suitable exhibits will convey some idea as to the scope and magnitude of the exhibition:

Alloys of all kinds.
Aluminium—castings, ingots, rod, sheet, tube, wire.
Aluminium Alloys.
Aluminium Solders.
Amalgams.
Anodes—brass, copper, nickel, platinum, silver, zinc.
Anti-friction Metals.
Antimony.
Assayers' Supplies.
Automatic Machines.
Babbitt Metals.
Bearing and Bearing Metals.
Bell Founding.
Bismuth.
Brass—castings, ingots, rod, sheet, tubes, wire.
Brassfoundry—naval, cabinet, art, plumbers and engineering.
Brass Tubing—solid brass, etc.
Brass Working Tools and Machinery.
Brazed Gunmetal.
Britannia Metal.
Bronze—ingots, castings and forgings.
Bronzes.
Cadmium.
Castings of Non-Ferrous Metals.
Chemical Apparatus.
Chromium and Alloys.
Coach Beadings.
Cobalt.
Condenser Tubes and Plates.
Copper—ingots, sheets, tubes, wires, plates, etc.
Corrosion and its prevention.
Crucibles.
Dental Alloys.
Dies—sheet metal working.
Draw Benches—wire, rod and tube.
Dynamos (platers' and galvanizers'.
Electro-brassing.
Electro Welding.
Electro-plating.
Extended Metals—rods, tubes.
Fender Moldings.
Fire Box—plates, copper.
Foundry Supplies and Equipment.
Furnace Linings.
Furnaces—annealing, brazing, galvanizing, tinning, etc.
Furnaces—Melting, for oil, coal, coke or gas.
Furnaces, reverberatory.
Fuses, electrical.
Fusion Welding.
Galvanizing Apparatus.
German Silver—sheets, wire, rods, etc.
Gold—ingots, bars, plates.
Gunmetal—ingots and castings.
Jewelers' Equipment and supplies.
Laboratory Supplies.
Lacquers, metal.
Lead—pig and sheets.
Locomotive Tubes.
Magnesium—strip and wire.
Magnetic Metal Separators.
Manganese-bronze—ingots and castings.
Manganese-copper.
Manganese-zinc.
Mercury.
Metal-cleaning Compounds.
Metal Goods—rough and finished.
Metal Working Machinery.
Minerals.
Muntz's Metal.
Nickel—pure, alloys, sheet, wire and rods.
Nuts, Bolts, Screws, etc.
Phosphor Bronze—castings, ingots, rods, sheets, wire, etc.
Phosphor Copper.
Phosphor Tin.
Plastic Metals.
Platers' and Polishers' Supplies and Equipment.
Platinum.
Polishing and Buffing Machinery, Appliances and Materials.
Presses—Automatic, Coining, Power, etc.
Pyrometers.
Rare Metals and their application.
Repousse Ware and Beating Copper.
Rods—copper, brass, bronze.
Rolls—chilled and sand.
Rolls—crimping and corrugating.
Rolling-mill Machinery.
Scientific Instruments.
Sheet Metal Straightening, Cutting, and Forming Machinery.
Sheets—brass and copper.
Sheradizing Ovens.
Silver.
Silver Plating.
Soft, Brazing, gold, silver, etc.
Solders.
Spelter.
Stays, Fire-box.
Steel Makers' Alloys—ferro-vanadium, ferro-chromium, ferro-nickel, etc.
Tin—ingots, foil, sheet.
Tubes, Locomotive and Condenser—brass and copper.
Tubing, Seamless.
Turbine Blading.
Type Metals.
Vanadium and Alloys.
Welding.
White Metals.
Wire Drawing.
Wire Mill Equipment.
Yellow Metal and Naval Brass.
Zinc—rods, sheet, wire.

ELECTRO-PLATERS' ASSOCIATION

President, Charles H. Proctor, Arlington, N. J.; Treasurer, H. H. Reama, New York, N. Y.; Corresponding and Financial Secretary, Royal F. Clark; Recording Secretary, Edward Faint. All correspondence should be addressed to the Corresponding Secretary, Royal F. Clark, 246 Fulton avenue, Jersey City, N. J. This is an educational society, the objects of which are to promote the dissemination of knowledge concerning the art of electro-deposition of metals in all its branches. Meets at Grand Opera House Building, 309 W. 23d St., on the fourth Friday of each month, 8 p. m.

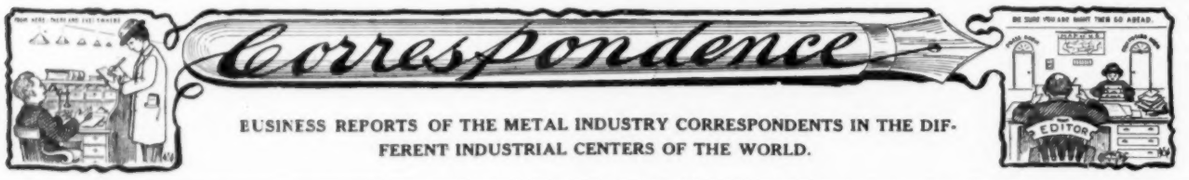
The thirty-second regular meeting of the association was held September 22, with President Proctor in the chair, at 8:15 p. m. One associate member was elected and several applications for membership were received and referred to the committee on membership.

The committee on amendments presented a report, recommending that the New York body shall continue to be the head or grand body until such time as it shall be deemed wise to form executive bodies, and amendments are offered to cover the change in the laws.

R. Schofield, of the Philadelphia branch, was present and spoke briefly. M. B. Chase, representing the Sangamo Electric Company, exhibited one of the ampere hour meters, giving a description of the meter and explaining how it should be used Papers were read by John Painter on Electro-Tin Deposition, and L. C. Donnell on Electro Deposited Black for Antique Work.

It was decided to hold the annual banquet February 10, 1912, place to be designated by the committee. A general committee was appointed as follows:—R. H. Sliter, Frank P. Davis, J m Painter, Thomas B. Haddow, Hugh Baxter, Royal F. Clark E. W. T. Faint. The next meeting will be held Friday, October 27, and will be open to all who wish to attend. All foreman platers are invited. Addresses will be given by eminent men in different branches of the art of electro deposition.

The fourteenth regular meeting of the Philadelphia branch was held Friday, September 29, at Dooners Hotel, and proved to be one of the most interesting meetings ever held. A committee was appointed to arrange for a banquet to be held some time during November. Papers were read by Julius Neu on Bright Silver and by Fred C. Clement on Brass Plating.



BUSINESS REPORTS OF THE METAL INDUSTRY CORRESPONDENTS IN THE DIFFERENT INDUSTRIAL CENTERS OF THE WORLD.

NEW BRITAIN, CONN.

October 9, 1911.

There has been a great deal of activity during the past few months among the hardware manufacturing concerns of this city. Business has been good, and all of the factories have run full time. Now some of the manufacturers are getting ready for their Christmas rush, and indications are that the year will close a prosperous one for the metal manufacturing concerns of the "Hardware City."

The most important hardware deal of years in this city was completed the latter part of September and provides for the merging under one head of all constituent companies, the stock of which is owned and controlled by the American Hardware corporation. The corporation now takes over the real estate owned by the constitutent companies, the stock in which it has controlled for years, making it an operating as well as a holding corporation. At the close of the meeting President C. M. Jarvis made a statement explaining the merger and the reason for it. A portion of his statement follows:

"For the last two or three years the directors of the American Hardware corporation have been giving serious thought to the organization of the corporation. When it was organized in 1902 it was agreed by the best lawyers in the country that a holding company was the best and most popular method for the control of consolidations of this kind. The interpretation of some of our laws, especially the Sherman act, so-called, during the past few years by the highest courts in the land had changed, and with a view of meeting this change the directors have decided to change the organization and merge the constitutent companies into the American Hardware corporation."

It was announced at the time of the merger that no change in the personnel of the officers of the various constitutent companies is contemplated. It is proposed to enlarge the field of the corporation and reach out into foreign countries, paying particular attention to the South American trade. A. J. Sloper has been made secretary of the corporation and C. E. Wetmore treasurer.

Charles Glover has been elected treasurer of the Corbin Screw Corporation to succeed Theodore E. Smith who died in August. Mr. Glover was formerly president of the concern, and in the future he will attend to the duties of both offices.

At a meeting of the directors of Landers, Frary & Clark, held September 28, the resignation of George M. Landers as an officer of the company was received and accepted. Mr. Landers will remain a director of the company, and the vacancy caused by his resignation will be filled at the annual meeting.

Willis H. DeWolfe has resigned his position as assistant superintendent of the P. & F. Corbin Company to accept a situation as general manager of the Reading Hardware Company, Reading, Pa. He will leave New Britain in thirty days, after having been in this city for many years.—A. L. M.

PROVIDENCE, R. I.

October 9, 1911.

There is now a very encouraging activity among the metal industries of this section that seem to indicate a good business from now until the end of the year. This is especially true concerning the manufacturing jewelry concerns and those engaged in allied and dependant trades. In the various metal foundry lines there is also a general activity that is encouraging and augers well for the winter's work. Few, if any, good workmen are now idle, and many shops are preparing to work their plants overtime to keep pace with the numerous orders that are coming in.

Among the manufacturing jewelers the rush is already on and is expected to increase from now until the end of November, when, the holiday rush having ceased, there will be a decline in the work. Bracelets and lockets are the principal lines that are moving, although mesh bags and other lines hold the attention of the market to a considerable degree. In the two former lines, however, there are not workmen enough in this city to fill the demands for experienced help. As a result of the increased activity among the manufacturing jewelers there is a corresponding increase among the refiners, platers, colorers and other kindred and allied branches.

Frank L. Hinckley, Rush Sturges and Abbot Phillips, all of this city, have recently received a charter from the Secretary of State, creating under the laws of the State of Rhode Island the Pawtucket Smelting & Refining Works, to be located in Pawtucket. The new corner has not yet commenced business, but it is understood that it will do a general refining and smelting business.

The copartnership hitherto existing between Joseph N. Mitchell and Henry S. Wright, under the firm name of Mitchell & Wright, metal patterns, at 95 Pine street, this city, has been dissolved by mutual consent.

The stock, tools, fixtures and business of the Enterprise Cornice Works, 186 Richmond street, this city, were sold at public auction at bankrupt sale on September 12, in lots desirable to the purchasers. The trustee in bankruptcy, Carl Riechert, reports good returns from the sale. W. H. M.

NEWARK, N. J.

October 9, 1911.

The manufacturing jewelry business is doing fairly well, but the activity is not great yet, although from now on every firm ought to be rushed with orders. The demand has been looking up for 14 karat and better, and the 10 karat lines have enjoyed a lively sale at all times. The business with the aluminum, brass and bronze concerns, who do a foundry business, or make novelties, have been pretty good, as these lines are in demand.

The new Technical High School on High street will be an industrial school, and will be equipped with a plant to manufacture jewelry, to plate, color, enamel, to make dies and all other work in connection. It will be one of the most complete schools of the kind in the country.

The Wheeler Jewelry Manufacturing Company have bought the Metallic Art Company, 125 Railroad avenue, and will run the works in connection with their own, and will move there from 73 Lafayette street. The Metallic Art Company makes German silver toilet articles.

A new firm to start in here making high-grade gold and platinum jewelry at 48 Walnut street is Brown, Jennings & Lauter. They have opened a first class plant, and a New York office has been started at 149 Maiden Lane.

Diffany & Co. moved from Prospect street to No. 207 Parkhurst street, in a new building of their own, where they have put in an up-to-date plant for the making of gold, silver, German silver, brass and metal purse bag frames.

William C. Fink, of Elizabeth, says he has an alloy that is a good substitute for aluminum. It does not corrode or tarnish under the influence of the air or acid fumes, and is only slightly tarnished by sulphur.

John C. Blevney moved his plant to 209 Parkhurst street, and is making polishing machines.—H. S.

CLEVELAND, OHIO

October 9, 1911.

Business with the manufacturers and dealers in metal goods during the month of September was unusually satisfactory, according to general reports from the trade. Foundries, plating establishments and manufactories of all kinds are working full time and do not expect to slacken down much for weeks yet.

The automobile factories are all busy getting out their 1912 models and are consuming large quantities of aluminum, brass and copper, metals which are entering more and more into the construction of high-grade automobiles. The White Company, which recently began turning out gasoline cars, is making several new models, while it is continuing to make its high-grade steam cars. The Winton Company has a new Winton Six which is a hummer, according to those who have tried out the latest model. Several other makers of high-grade cars costing from $2,500 up say they are very busy and look for a banner year.

The volume of building for the country is now far ahead of last year, though the number of big individual structures has not been as great. Thousands of new homes have been built which has netted big returns to the manufacturers of plumbing goods of all kinds. This city has several of the largest concerns of this kind in the country which report that business is excellent and that they have nothing to complain of.

The Ohio Brass & Fixture Company, of this city, which is furnishing the fixtures for the new addition to the Detroit post office, as well as several other big projects, is so busy that it will not contract to take on any new work for immediate delivery, demanding a three weeks' leeway before accepting new orders. The plant is choked up with business and is running extra time when men can be secured.

The Weber Company, which engages in the manufacture of brass ornaments, jardiniers and other brass work for home decorations, has been doing a big business this year, as the retail stores are this year showing a wider variety of this class of goods than ever before. The substantial wearing qualities of brass and copper when used in household ornaments make these good ready sellers at higher prices than asked for pottery and similar stock. S. L. McM.

DETROIT, MICH.

October 9, 1911.

The failure of reciprocity to pass in Canada has caused much regret in Detroit, where, if the measure had become a law, manufacturers of brass and aluminum products would have greatly prospered. President McRae, of the Chamber of Commerce, declares that no other city in the Union will feel the effects of this defeat as will Detroit, which is really the open door to the great Dominion. Many manufacturers had planned to make a vigorous campaign in Canada, especially in the northwest, where such large quantities of machines, including automobiles and brass products, are in demand. Although reciprocity is a thing of the past for this generation perhaps, manufacturers are not discouraged and have great hopes for the future, as soon as conditions settle following the agitation.

The brass and aluminum business continues about the same as it was one month ago. The factories are running fairly well, although there is no great amount of business in sight outside of that pertaining to the automobile trade. Building operations in Detroit and the Middle West begin to show a decline, due to the lateness of the season. In Detroit, however, there is much extensive work still uncompleted that will crowd well into the winter. No less than eight large steel cement skyscrapers are being erected or are nearly completed, which have demanded large quantities of plumbers' and other brass supplies.

The automobile business, instead of decreasing, becomes more intense than ever. The Herrschoff Motor Car Company has just begun the building of a new million dollar factory, and the Studebaker Corporation has started on the erection of buildings and making other improvements to its plants here that will cost $1,500,000. The Chevrolet Motor Car Company has also started work on a new factory that will cost, when completed, over $1,000,000. Every factory of this kind is now running full-handed. The E.-M.-F. factory within the last two weeks has added 1,000 more men to its list of employees. The Packard Motor Car Company, one of the largest in the city, is now employing 7,000 men, to say nothing of the large office staff. These great forces are now engaged on the 1912 models, all of which as in the past are beautifully trimmed in brass and require a large amount of aluminum castings. No one has any idea of the great amount of this product used by the automobile factories in Detroit.

"The rapid growth of the aluminum casting industry is a wonderful example of the magnitude of the motor car industry in Detroit," says Assistant General Manager B. C. Spitzley, of the Abbott-Detroit Motor Car Company, of this city. "Nine years ago the casting of aluminum was an experiment. Having a low melting point and being easily handled in cast iron pots, castings from this metal proved exceedingly attractive to many foundries. No accurate knowledge of how it was affected by the oxidizing influence of the melting flame were obtainable, and the difficulties encountered after losses more or less heavy had been sustained, resulted in centralizing this work in a few shops where a specialty was made of it. Today little trouble is experienced from the difficulties once encountered. Owing to its lightness, aluminum has entered largely into automobile construction, and parts not subjected to severe strains are now made from it. Aluminum crank and gear cases of the most intricate design are successfully cast. The high shrinkage is overcome by the judicious use of risers and chills placed in the molds.

"The growth of this industry has been coincident with the expansion of the automobile trade, and the industry will consume approximately 8,000,000 pounds of aluminum a year. Automobile manufacturers are the largest users of aluminum in the world, although a large outlet for the metal is found in the steel works, where it is extensively used."

New Michigan corporations recorded during the past month are the following: Michigan Brass & Foundry Company, Detroit, $30,000; United Brass & Foundry Company, Detroit, $10,000; Suburban Motor Car Company, Detroit, $500,000. F. J. H.

TRADE NEWS

TRADE NEWS OF INTEREST DESIRED FROM ALL OF OUR READERS. ADDRESS THE METAL INDUSTRY, 99 JOHN STREET, NEW YORK

ADDITIONAL TRADE NEWS WILL BE FOUND UNDER "CORRESPONDENCE."

L. E. Clay, gold and silver plater, Newark, N. J., has started in business for himself in Room 613, Richardson building, Columbia street.

The Polishing & Plating Company, polishers and platers, P. Leony, manager, Woonsocket, R. I., have opened a shop at 196 Park place.

The Gorham Manufacturing Company, Providence, R. I., have been awarded the contract to cast the bronze figure for the North Attleboro, Mass., soldiers' monument.

The Hanson & Van Winkle Company, manufacturers of polishing and plating supplies, Newark, N. J., are making a three-story addition to their plant, 30 by 50 feet.

The Baird Machine Company, manufacturers of presses, tumbling barrels, etc., Oakville, Conn., is about ready to occupy its new plant at Bridgeport, Conn., which will greatly facilitate the handling of their growing business.

The E. C. Bliss Manufacturing Company, of Providence, R. I., reports considerable progress with its tumbling barrel. The barrel is made for polishing small metal articles and jewelry, and the company report a number of very satisfactory tests.

The Badger Foundry Company, Racine, Wis., are now building a large fireproof brick addition to their present plant, which will greatly increase the facilities of the foundry. The addition will be constructed with a steel framework.

It is reported that the 1911 business of The Meaker Company, platers, polishers' and galvanizers' supplies, Chicago, Ill., has been the largest in the experience of the company, and they are now making preparations to double the capacity of their plant.

The Automatic Buffing Machine Company, Buffalo, N. Y., report that they continue to put in their automatic polishers in brass shops, among their recent sales were two to the Badger Brass Company, Kenosha, Wis., making eighteen in that plant.

The Chicago Brass Company have increased their capacity by purchasing the land and buildings now occupied by the Frost Manufacturing Company, Kenosha, Wis. It is anticipated that this transfer will mean the erection of a new plant for the Frost company.

Rockhill & Vietor, 114 John street, New York, recently shipped one of the "Nonesuch" plating barrels to Yokohama. This machine is to be used for nickel plating and will be the first plating barrel, equipped with canvas cylinder panels, to be imported into Japan.

Announcement was made a week ago by Benjamin A. Hawley, president of the Russell & Erwin Company, that the concern is soon to erect a new seven-story factory to accommodate its ever-increasing business. The building will be of reinforced concrete, and will contain about 45,000 square feet of floor space.

Linton and Company, 95 Pine street, Providence, R. I., report that they are busy on rolled gold plate, which they make in all colors, all widths and any thickness desired; likewise they make jewelers' wire, all gauges, and gold solder, silver solder and sheet brass solder. They have all the business they can attend to.

B. Conlan & Company, manufacturers of metal novelties, Hamilton street, Newark, N. J., which was established in 1871, have just completed a new addition to their present factory. With their increased facilities Conlan & Company will be in a better position to handle their growing trade.

The Carborundum Company, Niagara Falls, N. Y., has been engaged the past month in remodeling the interior of its office by removing the partitions and throwing the entire office floors into one room, with the exception of the executives' private suites. The change will give a story and a half addition and 6,000 more square feet of office space.

The Pusey & Jones Company, of Wilmington, Del., have just placed the order with the Ruggles-Coles Engineering Company, of New York, general agents for the Bayonne Casting Company, Bayonne, N. J., for two 56-inch propellers, to be cast on Monel metal for the large private yacht which they are building.

The increasing use of various metals for personal adornment is much in evidence on the street and in the shop windows this fall. Articles, such as flowers, feathers and laces, are metalized and employed for dress trimmings and decorations, and also for hats. Some of the decorations for the latter being metal fringe, silver and bronze flowers, gold and silver laces.

The Eclipse Air Brush and Compressor Company, Bloomfield, N. J., state that their new dry bronze sprayer is being used effectively by a number of concerns for spraying a metallic coating of bronze powder on plaster of paris casts which are to be copper-plated. They state that this method of applying the metallic coating is very much more satisfactory than any of the old methods.

The Norton Grinding Company, manufacturers of abrasives, Worcester, Mass., are now occupying the new brick building, which is part of the addition they are making to their plant. This building is 40 by 70 feet, three stories, and contains the new drafting room and the engineering quarters. The main portion of the addition will be 84 by 265 feet, one story, with balconies.

A visitor to the Colorado State House, Denver, Col., is surprised at the amount of brass work in its interior. Instead of the usual stone balusters, they are made of polished metal, we believe aluminum bronze, which was made by a Bridgeport, Conn., foundry many years ago. The people of Colorado certainly favored metals in the construction of their State capitol.

The H. Mueller Manufacturing Company, of Decatur, Ill., the largest manufacturers of plumbers' brass goods in this country, have decided to build a Canadian plant to take care of their rapidly growing business in that country, and are now looking for a suitable location. The capitalization of the Canadian corporation will likely be in the neighborhood of $200,000, and it is expected that eventually 150 men will be employed.

An open meeting of the National Electroplaters' Association will be held October 27, at 8 p. m., in the Grand Opera House Hall, corner 8th avenue and 23rd street. At this meeting W. A. Jones, general manager of the Celluloid Zapon Company; Geo. C. Backus, of Backus & Leeser; M. B. Chase, of the Sangamo Electric Company; Mr. Brown, of Weston Electrical Instrument Company and others will give short addresses on tropical subjects. All foremen electroplaters are cordially invited to attend.

The Ames Sword Company, manufacturers of endless sewed polishing belts, Chicopee, Mass., has been reorganized, owing to the recent death of John D. Bryant, president, and Gamaliel Bradford, treasurer. At a recent meeting of the directors, held at Boston, I. Homer Sweetser, of Boston, was elected president; Chas. A. Buckley, Chicopee, clerk and treasurer, and A. L. Howard, Boston, and Charles A. Buckley, directors.

The Williamsville Buff Manufacturing Company, manufacturers of cotton buffs, Danielson, Conn., report that they have started operations in their new factory in the above-named city, having removed from Williamsville, where the company manufactured the same product under the name of the Williamsville Manufacturing Company. The officers of the company are: C. W. Atwood, president and treasurer; H. C. Atwood, vice-president, and H. B. Atwood, secretary.

The Emery Candle Company, Cincinnati, Ohio, manufacturers of Stearic Acid, Elaine (Red Oil) and Metal Polish Stearine, articles particularly adapted for the manufacture of metal polish, state that these articles when mixed in the proper proportion with the polishing powder, have the property of keeping the liquid polish in emulsion; that is, the powder does not settle in the bottom. The company say that their sales on these articles to the metal polish trade are probably larger than those of any other concern in the country.

The Lumen Bearing Company, of Buffalo, N. Y., has been engaged this past summer on bronze castings of 500 pounds weight for the Panama Canal. Despite the prevailing mid-summer quiet period, August was the best month the company ever had, all departments, foundry, finishing, babbitt and solder being pushed to their utmost capacity. By the company's purchase of the white metal business, formerly conducted by the Robson Smelting Company, they have a regular white metal department in charge of Mr. Greenberg, who is well known in the foundry and metal trades.

The ground-breaking of the 1915 Panama-Pacific Exhibition will begin the fourteenth of October, and President William H. Taft will turn the first shovel at the stadium in Golden Gate Park, San Francisco, Cal. The invitation to the President will be especially designed on a gold plate, the gold to make this plate has been delivered by the Imperial Mining Company, Grass Valley, Cal., the oldest gold mine in the State. The work of art will probably be done by the firm of Shreve & Company, Van Ness avenue and Sacramento street, San Francisco.

Fritz A. Schultz, manufacturer of metal spinning lathes and sheet metal working tools, Chicago, Ill., has purchased the land and building at 4824-26 West Lake street. One of the buildings is 150 by 125 feet and the other 30 by 40 feet. Considerable alterations will be made. Mr. Schultz states that he does not know just when he will move into his quarters, as the lease on his present location on North Jefferson street does not expire for some months. The additional machinery and equipment, which will be required, will not be purchased until after January 1, 1912.

Proposals will be received at the Bureau of Supplies and Accounts, Navy Department, Washington, D. C., until 10 o'clock a. m., October 24, 1911, and publicly opened immediately thereafter, to furnish at the navy yard, Brooklyn, N. Y., a quantity of naval supplies as follows: Sch. 3989, brass, bar, 1,100 lbs.; brass, sheet, 19,100 lbs.; tubes, composition. At the navy yard, Washington, D. C., sch. 3986, bronze, naval 6,700 lbs.; copper, sheet, 775 lbs.; tubing, bronze and copper. At the navy yard, Newport, R. I., sch. 3986, tubing brass, 10,000 lbs. The following proposals will be received until October 31, 1911: At the navy yard Mare Island, Cal. Sch. 3978, Gauze, wire, brass, 60 square yards; grommets, brass, spur, 100 gross; sch. 3979, copper, ingot, 60,000 lbs.; pipe, copper, 2,000 lbs.; sch. 3975, pipe, lead, 17,700 lbs.

One of the aluminum stores in the United States, which has prospered and not followed the usual custom of retiring from business, is the Pittsburgh Aluminum Company, of San Francisco and Los Angeles. Their San Francisco store is filled with all kinds of aluminum goods and is of about the same size as the aluminum stores of New York some ten years ago. The Pittsburgh people report that their Los Angeles store is four times as large as the San Francisco one, and both stores are doing a flourishing business in supplying the wholesale and retail demand with all kinds of kitchen, household and general ware. The same class of business in the East is now carried on by the department stores and the house furnishing shops rather than by the exclusive aluminum stores.

Leiman Brothers, 62-J John street, New York, manufacturers of blowers, sand blasts and jewelers' equipment, who recently put up a large addition to their factory at Newark, are now buying up property all around their works with a view to further additions later on. They propose installing an iron foundry, which will enable them to produce their goods complete from the raw material in their own works. This concern recently shipped a blower and sand blast to the Osaka Mint, Japan, to be used in making medals which will be awarded the heroes of the Japanese army. This sale was made in competition with all makers of sand blasts which the Japanese government could locate. Leiman Brothers state that the original inquiry came to them through an advertisement in THE METAL INDUSTRY.

An impression has been conveyed in some quarters that the F. B. Shuster Company, manufacturers of wire straightening machines, elastic rotary blow riveting machines, etc., New Haven, Conn., is to go out of business by reason of the death of F. B. Shuster last August. The company state that the business is to be continued on the same lines and under practically the same management as before. The question of selling out, or closing up the business has never been considered. In spite of the general depression throughout the summer they have continued to run full time, with a full force of men, and have turned out some very large orders. They now have a large amount of business on hand in their regular and special lines, and the prospects ahead are very bright for a good business through the fall and winter. The personnel of the company is L. P. Shuster, president and treasurer; Geo. D. Phillips, vice-president; E. L. Shuster, secretary; G. T. Ensign, assistant secretary.

The Routh Solder Company, of 12 Hobson street, Newark, N. J., are now manufacturing Routh solders in a new factory, which has been fitted up especially for them. The company manufactures three grades of solder; No. 1 claimed to be equal to strictly half and half; No. 2, which is said to rank with the commercial half and half, and No. 3, which has the efficiency of refined solder, and at the same time is acid proof with relation to sulphuric acid. It is claimed that these solders do not contain any injurious or poisonous ingredients. They flow very easily and can be used for joint wiping. The price of Routh solders are very much below the market price of other solders, and the company is now soliciting correspondence from those interested in solder, and free samples will be sent upon request. The Routh Solder Company is incorporated with a capital stock of $50,000.

WENTWORTH INSTITUTE

A new trade school has been opened in Boston known as the Wentworth Institute. This institute, which is named after its founder, Arioch Wentworth, was established through his munificence for the distinct purpose of furnishing education in the mechanical arts. The buildings and equipment of the institute include the foundry, the main shop building, 145 by 49 feet, five stories high, which contains the carpenter shop, the plumbing shop and the electrical wire room, and a large power house 80 feet square, and a wing extending to the south for administration purposes. The aim of the new school is to give young men practical instruction, which will enable them to enter industrial life prepared to do and earn from the moment of graduation. The curriculum of the school includes a one year course in foundry practice, which is intended to cover all branches of molding and core making, and the technical theory of the subject is to be taught in conjunction with practical instruction in various phases of the shop practice of founding.

The courses of this school are open to working boys and men

who desire to learn a trade or to better themselves in their chosen occupation. The fees are six dollars per term for day students and six dollars per season of two terms for evening students. Full information regarding this school may be obtained by addressing the principal, A. L. Williston, Westworth Institute, Huntington avenue and Ruggles street, Boston, Mass.

CHANGE OF FIRM

E. H. Wirtembeurg, proprietor of the Ansonia Brass Foundry Company, manufacturers of brass and bronze castings, Ansonia, Conn., has sold the entire equipment of the plant to H. D. Phelps, brass goods manufacturer of Ansonia.

The Fostoria Aluminum Manufacturing Company, Mishawaka, Ind., has changed its name to the American Casting Company. The plant which is now doing more work than ever in the casting of aluminum, brass and bronze, will be equipped with new machinery. The following officers and directors were elected: W. H. Rockhoff, president and treasurer; W. H. Gilbert, vice-president and B. E. Rockhoff, secretary; the officers and Fred Rockhoff constitute the board of directors.

FIRE

The brass foundry of P. L. Lowry, Merrimac, Mass., was burned to the ground on August 30. Mr. Lowry's loss consisted of stock and machinery, amounting to $4,500, which is covered by insurance. He expects to build on a plot of ground which he owns as soon as possible, as business was very good before the fire. Mr. Lowry carries on a foundry, machine, polishing and plating business.

INCREASE OF CAPITAL STOCK

At a meeting of the stockholders of the Scovill Manufacturing Company, manufacturers of brass and brass goods, Waterbury, Conn., it was voted to increase the capital stock of the company to $5,000,000.

REMOVALS

The Non-Corroding Metal Company have removed their office from 50 Church street, New York, to 55 Hudson street, Jersey City, N. J.

The Keystone Bronze Company, Pittsburgh, reports through John S. Craig, secretary and treasurer, that they have removed their general office from Thirty-ninth street to the Farmers' Bank building.

The New York office of the Taunton-New Bedford Copper Company, manufacturers of Muntz metal, naval bronze, manganese bronze, etc., New Bedford, Mass., has been removed from 77 Water Street to 42 Water Street.

The International Oxygen Company have removed their New York headquarters from 68 Nassau street to 115 Broadway, where increased facilities have been secured for transacting their steadily growing business.

The works and principal office of the Acorn Brass Manufacturing Company, Chicago, Ill., has been moved to Aurora, Ill., where they will occupy the building vacated by the Richards-Wilcox Manufacturing Company.

The Imperial Art Company, New York, successor to the Imperial Art Jewelry Company, formerly located at 57 W. 25th Street, have removed their offices and factory to 59 Park Place, where they have better facilities for carrying on their business.

The Riehl Manufacturing Company, Cleveland, Ohio, have moved from 5411 Bower avenue, S. E., to 1232 East Third street. They announce that this change was made necessary by the increasing demand for their well-known wheel brushes, which they claim to be the most economical and durable made, being, in fact, practically indestructible.

INCORPORATIONS

Business organizations incorporated recently. In addressing them it is advisable to include also the names of the incorporators and their residence. Particulars of additional incorporations may frequently be found in the "Correspondence" columns.

THE BELLINGHAM BRASS MANUFACTURING COMPANY, Bellingham, Wash. Capital stock, $50,000. Incorporators: C. J. Christopher, F. B. Carrion and E. M. Wilson, all of Bellingham.

THE UNITED BRASS & FOUNDRY COMPANY, Detroit, Mich. Capital stock, $10,000. To engage in a general foundry business. Incorporators. Thomas Walburn, M. B. Walburn and William Brabant, all of Detroit.

THE WARREN TOOL & FOUNDRY COMPANY, Warren, Ohio. Capital stock, $10,000. To manufacture tools. Incorporators: James D. Robertson, O. R. Grimmesey, George Braden, Z. F. Craver and R. A. Cobb, all of Warren.

PRINTED MATTER

HYDROFLUORIC ACID.—A valuable booklet relating to hydrofluoric acid and its uses has been issued by the Hydrofluoric Manufacturing Company, York, Pa. Full directions for using and descriptions of installations for handling the acid are given in the booklet, together with formulas for bright and satin finish dips.

LINING ALLOYS.—A small booklet, giving a description of the origin and use of babbitt metals, has been issued by the Lumen Bearing Company, brass founders, Buffalo and Toronto. The booklet is edited by Alfred H. Greenburg, manager of the babbitt department, who was formerly connected with the Homogen Company, of Cleveland, Ohio.

GALVANIZING.—The U. S. Electro Galvanizing Company, Brooklyn, have issued a catalogue, giving descriptions of their patented machinery and process for automatic electro-galvanizing. Among these devices might be mentioned the patented automatic self-emptying galvanizing barrel, provided with washing and drying apparatus; and also the patented self-emptying plating barrel for brass, nickel, tin, zinc, etc. Copies of the catalogue may be had upon request.

FELT.—The Bacon Felt Company, manufacturers of felt and felt polishing wheels, Winchester, Mass., have published a circular giving descriptions of their patent solid felt polishing and buffing wheels, and also of their felt bags and filters and felt in square sheets. This concern furnishes felt of all descriptions for the jewelry, silverware and hardware trades, and for polishing nickel, brass, copper and other metals and materials. Samples will be sent upon applications.

GRINDING AND POLISHING MACHINERY.—The Webster & Perks Tool Company, Springfield, Ohio, publish a 32-page catalog, giving illustrations and descriptions of their extensive line of floor grinders, buffing and polishing lathes, bevel safety flanges and wheel guards or protection hoods. This company also manufacture special machinery to order and multiple spindle horizontal thread cutting and special tapping machinery, etc. Copies of the catalog will be sent upon request.

METALS.—The Taunton-New Bedford Copper Company, copper and brass rolling mills, of Taunton and New Bedford, Mass., issue a folder giving information relating to the extensive line of metals that they manufacture. Among their products are pure copper nails and tacks, yellow metal sheathing, slating and boat nails, Hill knife switches for use on switchboards, panel

boards and cabinets, naval brass, naval bronze and manganese bronze and metal mixtures to order of all varieties and descriptions.

FLUXES.—The New Era Manufacturing Company, Kalamazoo, Mich., are circulating some information relating to their "metaloyed" flux. This flux is used for deoxidizing purposes in brass or bronze, copper and aluminum castings. The New Era company claims that this flux is the only metallic reducing agent which does not temper the alloys in which it is used, and this is the safest, cheapest and most efficient non-tempering flux or deoxidizer on the market. Samples of this flux will be sent upon request.

SPRAYERS.—A comprehensive booklet entitled "The Sprayer's the Thing" No. 2, for applying Egyptian air drying, spraying lacquers, has been issued by the Egyptian Lacquer Manufacturing Company, of New York. This book, which is gotten up in a very attractive style, gives complete directions for the spraying on of lacquers by the use of the air sprayer. The work really constitutes a valuable handbook rather than a catalogue, and should be at the hand of every user of lacquer. Copies may be obtained upon application.

METALS.—A. I. Devine, Columbus, Ohio, has published a small book entitled "Metal Mixer." This book gives information regarding the origin of metals, the method of extraction, their names, properties and the different alloys needed for practical use. It also explains mixing and melting, and gives a "cost and loss system" that should be invaluable to the founder. Tables of losses for brass, red brass and bronze are given, and if closely studied will furnish data for making any particular mixture that may be desired. This little book sells for one dollar.

METAL STATISTICS.—The seventeenth annual issue of comparative statistics of lead, copper, spelter, tin, aluminum, nickel, quicksilver and silver, for the ten years, including 1901-1910, has been issued by the Metallbank und Metallurgische Gesellschaft, Frankfort-on-Main, Germany. This book, which comprises more than one hundred pages, gives complete statistics relating to the world's production and consumption of the metals mentioned above. In addition, there are also tables of prices of the various metals and separate estimates of their production.

ALLOY FLUXES.—The International Flux Company, Evansville, Ind., are sending out a small booklet giving description of their Jewett bronze alloy flux which is used for the manufacture of castings of brass, bronze, aluminum, etc. The manufacturers say of this flux that it melts all kinds of brass in the shape of scrap, turnings, buffings, and sweepings, and will make sound castings without the use of separators of any kind. They also claim that by the use of this flux the life of the crucible and furnace lining is saved with economy of time and fuel. Ten pound packages of this flux will be sent free with directions for use if a statement is given for which purpose the flux is indicated to be used.

DYNAMOS.—The Hanson & Van Winkle Company, Newark, N. J., have issued Bulletin No. 105, descriptive of a line of low-voltage dynamos which they manufacture. These dynamos, which are compound wound, are claimed by the manufacturers to maintain the initial voltage up to the full capacity of the dynamo without drop, that is, the voltage being set by means of the field rheostat, one piece, or a number of tanks full of work, can be deposited without either rise or drop in voltage; this factor remaining constant under all conditions. Copies of this bulletin will be sent upon request, as well as Bulletin No. 106, which gives details of their wire system of current distribution.

CATALOGUE EXHIBIT

An exhibition of every kind of catalogue may be seen at THE METAL INDUSTRY office, 99 John street, New York. THE METAL INDUSTRY is prepared to do all of the work necessary for the making of catalogues, pamphlets, circulars and other printed matter. Estimates will be furnished for writing descriptions, making engravings, printing, binding, for the entire job from beginning to end or any part of it.

AD NEWS

The Treibacher Chemical Works, 210 East Twenty-third street, New York, continue to advertise "Auermetall," which is largely used in devices depending on a friction spark for ignition.

The Emery Candle Company, Cincinnati, Ohio, invite users of stearine, stearic acid and elaine (red oil) to correspond with them regarding their products, which are extensively used in the manufacture of metal polishing compounds, etc.

C. W. Leavitt & Company, Hudson Terminal, New York, feature in their advertisement their pure metallic magnesium. They claim that Leavitt's Brand is the best deoxidizer for all brass foundry mixtures.

Bennett-O'Connell Company, 15-17 South Clinton street, Chicago, Ill., have a page advertisement devoted to their new plating dynamo, "Excel-All," the unique features of which are well illustrated and described.

The Mott Automatic Sand Blast Manufacturing Company, 24-30 South Clinton street, Chicago, Ill., make a very substantial and efficient sand blast for foundry use, etc., which is illustrated and described in their ad. in this issue.

The Eclipse Air Brush and Compressor Company, Bloomfield, N. J., feature this month their new Eclipse lacquer sprayer, which was designed especially for lacquer and other light liquids, and which is sold at $22, which price they claim is lower than that of any other air brush of equal capacity and efficiency.

The Anderson Chemical Company, 100 William street, New York, announce that concerns having difficulty in obtaining amyl acetate, fusel oil and gun cotton can secure these materials from them very promptly. This firm is one of the largest manufacturers of and dealers in this material in the United States.

T. P. Kelly & Company, 544-546 West Twenty-second street, New York, and Eighteenth and Sangamon street, Chicago, Ill., advertise the "Infallible Kelly Facing" in this issue. This firm is well known as makers of foundry facing and supplies, and furnish imported and domestic graphite, etc. They also make a specialty of "Glutrin," which they carry in stock.

The Apothecaries Hall Company, 18 Benedict street, Waterbury, Conn., invite inquiries for all kinds of platers', buffers' and polishers' supplies, especially in the line of chemicals. They also furnish lacquer and solvents, japans, etc., lycopodium and parting compounds. This firm has been supplying platers, polishers and manufacturers with high grade chemicals and supplies since 1849.

Haas Brothers Supply Company, 55-57 Lafayette street, Newark, N. J., advertise "Hascoline" burnishing compounds and burnishing chips, also "Hascoline" drawing compounds and chips for drawing tubes and for re-drawing on presses. "Hascoline" products were the first compounds of this class put on the market, and the manufacturers claim the largest sales of any concern in this line.

The Harral Chemical Company, 467 Greenwich street, New York, manufacture a number of specialties for metal working and finishing, including burnishing compounds for use with steel balls in tumbling barrels, fig cleanser for cleaning metals, kleen-easy for removing Vienna lime, coco tallow chips for blanking and drawing, soft castile compound for wire drawing. These products are advertised on another page and the company will gladly submit samples and quotations on large or small orders on request.

METAL MARKET REVIEW

NEW YORK, October 9, 1911.

COPPER.

The copper market during the month has been very steady, prices today are a few points lower than a month ago, and considering the general feeling of pessimism that is in the air, this showing of the copper market is remarkably good.

There is nothing in the trade of the country condition of crops, or the present business of the iron and steel market to justify the late collapse in Wall street and if it were possible to get at the truth of this movement it is more than probable that the facts would show that the market was manipulated by the leading banking house in the country for the purpose of shaking out certain holders of steel stock. The report is common gossip in the street, there is no way of proving it or disproving it, but we give it for what it is worth.

The exports during the month were fairly heavy, 25,745 tons, making total exports so far this year 249,496 tons, against 211,951 tons for the same period last year.

Consumers have been buying only for immediate needs and prices today are a few points lower than a month ago. Lake is quotable at 12½ cents, Electrolytic at 12¼ and Casting brands at around 12⅛ cents.

The foreign market shows a net decline for the month of only £1 per ton and this in face of all the political unrest in Europe is a remarkable showing. The foreign stocks of copper show a decrease in the total visible stocks of 830 tons for the month, showing a total today of 67,340 tons against 83,800 tons on the 1st of January.

TIN.

The trend of the tin market has been entirely in buyers' favor and from the quantity taken by consumers during the month they have taken advantage of the sagging market to replenish their stocks on a very favorable basis.

The market opened at around 42 cents, prices reached 42½ as about the highest and later declined to close to 37½ cents, later prices advanced again and the reports now are that the bull syndicate have taken a fresh grip on the market and the bears are likely to be caught short again on a rising market.

Spot tin today is quotable at 41 cents, with October and November a few points lower.

The foreign market opened at £190, sagged off to £169 15s., and closed at £179 15s., that about gives one the whole doings in London during September.

LEAD.

The lead market has ruled very steady at 4½ to 4.55 New York and closes rather easier at 4½ cents carload lots, New York. The market in St. Louis is quiet at around 4.35 f. o. b. East St. Louis.

SPELTER.

The New York market has held steady at 6 cents for carload lots, while prompt Western shipments and later deliveries could be secured at a shade lower.

ALUMINUM.

The aluminum market is easier again and wholesale prices for spot and future deliveries are close to 19 cents to 19¼ against 19½ to 19¾ a month ago.

ANTIMONY.

Cooksons antimony is about ⅛ cent lower at 8¼. Halletts around 7¾. Chinese and Hungarian grade at around 7 cents.

SILVER.

The silver market has ruled very steady, at a range about ½ cent per ounce during the month, closing at 52¾ cents, New York and 24 5/16d. in London.

QUICKSILVER.

The market is a shade easier at $46.00 for wholesale lots, against $47.50 a month ago. Retail jobbing lots at $47 to $47.50 per flask.

PLATINUM.

The market is firmer and prices today are from $1.50 to $2.00 per ounce higher. Hard (10 per cent.) is quotable at $48.50 per ounce and refined at $46. Iridium is quotable at $64.50 per ounce.

SHEET METALS.

Sheet copper is quotable on list at 16½ cents base, but this price can be shaded, copper wire is nominal at 13½ to 13¼, while copper clad steel wire is quoted at 13 cents. The brass list is unchanged, but market is easier and prices are being shaded.

OLD METALS.

The market is very dull, the export business has been quieter on account of the unsettlement in Europe and home consumers are only buying for immediate needs. Prices are about the same as a month ago.—J. J. A.

COPPER PRODUCTION

(Issued by the Copper Producers' Association.)

		October 9, 1911.
Stocks of marketable copper of all kinds on hand at at all points in the United States, September 1, 1911		133,441,501
Production of marketable copper in the United States from all domestic and foreign sources during September, 1911		115,588,950
		249,030,451
Deliveries:		
For domestic consumption	57,311,584	
For export	50,824,011	
		108,135,595
Stocks of marketable copper of all kinds on hand at all points in the United States, October 1, 1911		140,894,856
Stocks increased during the month of September		7,453,355

SEPTEMBER MOVEMENTS IN METALS

	Highest.	Lowest.	Average.
COPPER.			
Lake	12.70	12.50	12.60
Electrolytic	12.50	12.25	12.40
Casting	12.35	12.15	12.25
TIN	42.50	37.50	40.00
LEAD	4.55	4.50	4.55
SPELTER	6.00	6.00	6.00
ANTIMONY (Hallett's)	7.75	7.70	7.75
SILVER	.52¾	.52¼	52.50

WATERBURY AVERAGE

The average price of lake copper per pound as determined monthly at Waterbury, Conn. :

1910—Average for year 13.13½. 1911—January, 12⅞; February, 12¾; March, 12½; April, 12½; May, 12⅜; June, 12⅝; July, 12¾; August, 12¾; September, 12⅝.

INQUIRIES AND OPPORTUNITIES

Under our directory of "Trade Wants" (published each month in the back advertising pages), will be found a number of inquiries and opportunities which, if followed up, are a means of securing business. Our "Trade Want Directory" fills wants of all kinds. See Want Ad. pages.

DAILY METAL PRICES

We have made arrangements with the New York Metal Exchange by which we can furnish our readers with the Official Daily Market Report of the Exchange and a year's subscription to THE METAL INDUSTRY for the sum of $10. The price of the Report alone is $10. Sample copies furnished for the asking. We can furnish daily telegraphic reports of metal prices. Address THE METAL INDUSTRY, 99 John street, New York.

Metal Prices, October 9, 1911

NEW METALS.	Price per lb. Cents.
COPPER—PIG, BAR AND INGOT AND OLD COPPER. Duty Free, Manufactured 2½c. per lb.	
Lake, carload lots	12.50
Electrolytic, carload lots	12.25
Casting, carload lots	12.15
TIN—Duty Free.	
Straits of Malacca, carload lots	41.00
LEAD—Duty Pigs, Bars and Old, 2½c. per lb.; pipe and sheets, 2⅜c. per lb.	
Pig lead, carload lots	4.55
SPELTER—Duty 1⅜c. per lb. Sheets, 1⅝c. per lb.	
Western carload lots	6.00
ALUMINUM—Duty Crude, 7c. per lb. Plates, sheets, bars and rods, 11c. per lb.	
Small lots	28.00
100 lb. lots	25.00
Ton lots	19.25
ANTIMONY—Duty 1½c. per lb.	
Cookson's, cask lots, nominal	8.25
Hallett's cask lots	7.75
Chinese	7.20
Hungarian grade	7.20
NICKEL—Duty Ingot, 6c. per lb. Sheet, strips and wire 35 per cent. ad valorem.	
Shot, Plaquettes, Ingots, Blocks according to quantity	.43 to .60
MANGANESE METAL—Duty 20 per cent.	.90
MAGNESIUM METAL—Duty 3 cents per pound and 25 per cent. ad valorem (100 lb. lots)	1.85
BISMUTH—Duty free	2.10
CADMIUM—Duty free	.90
CHROMIUM METAL—Duty 25 per cent. ad val.	.98
	Price per oz.
GOLD—Duty free	$20.67
SILVER—Duty free	.52¾
PLATINUM—Duty free	46.50
QUICKSILVER—Duty 7c. per lb. Price per pound	.68

Dealers' Buying Prices. Cents per lb.	OLD METALS.	Dealers' Selling Prices. Cents per lb.
10.75 to 11.00	Heavy Cut Copper	12.00 to 12.25
10.50 to 10.75	Copper Wire	11.50 to 11.75
9.75 to 10.00	Light Copper	10.50 to 10.75
9.25 to 9.50	Heavy Mach. Comp	10.50 to 10.75
7.00 to 7.25	Heavy Brass	8.00 to 8.25
5.50 to 5.75	Light Brass	6.75 to 7.00
7.00 to 7.25	No. 1 Yellow Brass Turnings	7.75 to 8.00
8.00 to 8.25	No. 1 Comp. Turnings	8.75 to 9.00
3.90 to 4.00	Heavy Lead	—— to 4.25
3.75 to 3.90	Zinc Scrap	—— to 4.25
5.00 to 5.50	Scrap Aluminum, turnings	6.00 to 7.50
10.00 to 12.00	Scrap Aluminum, cast, alloyed	11.00 to 13.00
14.00 to 15.00	Scrap Aluminum, sheet (new)	16.00 to 17.50
23.00 to 24.00	No. 1 Pewter	25.00 to 26.00
20.00 to 23.00	Old Nickel	23.00 to 26.00

INGOT METALS.			Price per lb. Cents.
Silicon Copper, 10% to 20%	according to quantity		28 to 35
Silicon Copper, 30% guaranteed	"	"	38
Phosphor Copper, 5%	"	"	19 to 21
Phosphor Copper, 10% to 15%, guaranteed	"	"	28 to 30
Manganese Copper, 30%	"	"	30 to 35
Phosphor Tin	"	"	34 to 36
Brass Ingot, Yellow	"	"	8½ to 9¼
Brass Ingot, Red	"	"	11 to 12½
Bronze Ingot	"	"	10 to 11
Manganese Bronze	"	"	17 to 19
Phosphor Bronze	"	"	13 to 16
Casting Aluminum Alloys	"	"	29 to 35

PHOSPHORUS—Duty 18c. per lb.
According to quantity ..... 30 to 35

PRICES OF SHEET COPPER.

BASE PRICE, 16.50 Cents per Lb. Net.

PRICES MENTIONED BELOW ARE FOR QUANTITIES OF 100 LBS. AND OVER.

SIZE OF SHEETS.		64 oz. and over 50 lb. sheet 30 x 60 and heavier.	32 oz. to 64 oz. 25 to 50 lbs. sheet 30 x 60.	24 oz. to 32 oz. 18¾ to 25 lb. sheet 30 x 60.	16 oz. to 24 oz. 12½ to 18¾ lb. sheet 30 x 60.	14 oz. and 15 oz. 11 to 12½ lb. sheet 30 x 60.	12 oz. and 13 oz. 9½ to 11 lb. sheet 30 x 60.	10 oz. and 11 oz. 7½ to 9½ lb. sheet 30 x 60.	8 oz. and 9 oz. 6¼ to 7½ lb. sheet 30 x 60.	Lighter than 8 oz.
		Cents Per Pound Over Base Price for Soft Coppers								
Not wider than 30 ins.	Not longer than 72 inches.	Base	Base	Base	Base	1	2	3	6	9
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	1	3	6	9	
	Longer than 96 inches.	"	"	"	"	2	6			
Wider than 30 ins. but not wider than 36 inches.	Not longer than 72 inches.	"	"	"	"	2	4	7	10	
	Longer than 72 inches. Not longer than 96 inches.	"	"	"	"	2	6	9		
	Longer than 96 inches. Not longer than 120 inches.	"	"	"	1	3				
	Longer than 120 inches.	"	"	1	2					
Wider than 36 ins. but not wider than 48 inches.	Not longer than 72 inches.	"	"	1	2	4	7	10		
	Longer than 72 inches. Not longer than 96 inches.	"	"	1	3	5	8			
	Longer than 96 inches. Not longer than 120 inches.	"	"	2	4	8				
	Longer than 120 inches.	"	1	3	6					
Wider than 48 ins. but not wider than 60 inches.	Not longer than 72 inches.	"	Base	1	3	6	11			
	Longer than 72 inches. Not longer than 96 inches.	"	"	2	4	9				
	Longer than 96 inches. Not longer than 120 inches.	"	1	3	6					
	Longer than 120 inches.	1	2	4	8					
Wider than 60 ins. but not wider than 72 ins.	Not longer than 96 inches.	Base	1	3	8					
	Longer than 96 inches. Not longer than 120 inches.	"	2	5	10					
	Longer than 120 inches.	1	3	8						
Wider than 72 ins. but not wider than 108 ins.	Not longer than 96 inches.	1	3	6						
	Longer than 96 inches. Not longer than 120 inches.	2	4	7						
	Longer than 120 inches	3	5	9						
Wider than 108 ins.	Not longer than 132 inches.	4	6							
	Longer than 132 inches.	5	8							

The longest dimension in any sheet shall be considered as its length.

CIRCLES, SEGMENTS AND PATTERN SHEETS, advance over prices of Sheet Copper required to cut them from 3 cents per pound.

COLD OR HARD ROLLED COPPER, 14 oz. per square foot, and heavier, add ..... 1 " " "

COLD OR HARD ROLLED COPPER, lighter than 14 oz., per square foot, add ..... 2 " " "

POLISHED COPPER, 20 INCHES WIDE and under, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 1 " " sq. ft.

POLISHED COPPER, WIDER THAN 20 INCHES, advance over price for Cold Rolled Copper of corresponding dimensions and thickness ..... 2 " " " "

COLD ROLLED COPPER, PREPARED SUITABLE FOR POLISHING, same as Polished Copper of corresponding dimensions and thickness.

COLD ROLLED AND ANNEALED COPPER SHEETS OR CIRCLES, same price as Cold or Hard Rolled Copper of corresponding dimensions and thickness.

ROUND COPPER ROD, ¾ inch diameter or over ..... Base Price.

(Rectangular, Square and Irregular Shapes, Copper Rod, Special Prices.)

ZINC—Duty, sheet, 1⅝c. per lb.	Cents per lb.
Carload lots, standard sizes and gauges, at mill	8.00 less 8%
Casks, jobbers' prices	8.50
Open casks, jobbers' prices	9.00

Metal Prices, October 9, 1911

PRICES ON BRASS MATERIAL—MILL SHIPMENTS,

In effect July 1, 1911, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13⅝	$0.14¼	$0.15⅞
Wire	.13⅝	.14¼	.15⅞
Rod	.13⅝	.15½	.16⅞
Brazed tubing	.18½	—	.20⅝
Open seam tubing	.16½	—	.18⅝
Angles and channels, plain	.16¾	—	.18⅝

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	⅛c.	per lb. net advance
" —Best spring, drawing and spinning brass	1⅛c.	" " "
Wire —Extra spring and brazing wire	⅛c.	" " "
" —Best spring and brazing wire	1c.	" " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14⅝	$0.15⅝	$0.16⅞
Wire	.14⅝	.15⅝	.16⅞
Rod	.14⅝	.16½	.17⅞
Brazed tubing	.19½	—	.21⅝
Open seam tubing	.17½	—	.19⅝
Angles and channels, plain	.17⅝	—	.19⅝

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	⅛c.	per lb. net advance
" —Best spring, drawing and spinning brass	1⅛c.	" " "
Wire —Extra spring and brazing wire	⅛c.	" " "
" —Best spring and brazing wire	1c.	" " "

BARE COPPER WIRE—CARLOAD LOTS.

13.50 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	17½c. per lb. base
100 lbs. to 300 lbs. in one order	18c. " " "
Less than 100 lbs. in one order	19½c. " " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	26	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod	16c.	net base
Muntz or Yellow Metal Sheathing (14" x 48")	14c.	" "
" " " Rectangular sheets other than Sheathing	16c.	" "
" " " Rod	14c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 22⅝c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

	Wider than.....	3in.	6in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.
	and including.....	12in.	14in.	16in.	18in.	20in.	24in.	30in.	36in.	40in.
		in coils.								
No.	13 and heavier	34	34	36	36	36	36	39	39	39
"	14	34	34	36	36	36	36	39	39	39
"	15	34	34	36	36	36	36	39	39	39
"	16	34	34	36	36	36	36	39	39	39
"	17	34	34	36	36	36	36	39	39	39
"	18	34	34	36	36	36	36	39	39	42
"	19	34	34	36	36	36	36	39	40	43
"	20	34	36	36	36	36	38	41	42	44
"	21	34	38	38	38	38	40	43	44	50
"	22	34	38	38	38	40	40	43	47	51
"	23	34	38	38	38	40	40	43	49	52
"	24	34	38	40	42	42	42	45	51	54
"	25	36	39	41	43	43	43	46	53	57
"	26	36	39	42	46	46	46	51	55	61
"	27	36	40	44	48	48	49	54	58	64
"	28	36	40	46	48	49	49	56	62	67
"	29	38	41	48	50	52	52	61	67	72
"	30	38	42	50	52	56	62	69	72	77
"	31	43	47	55	58	63	71	74	77	83
"	32	45	49	57	61	69	77	91	90	95
"	33	47	51	60	65	73	84	91	100	110
"	34	50	55	62	70	78	91	103	110	120
"	35	..	65	70	80	90	100	115	125	..
"	36	..	80	90	100	115	120	135	..	..
"	37	..	104	114	129	144	159	174	..	..
"	38	..	124	139	154	169	184	204	..	..
"	39	..	144	164	184	204	224	..	..	..
"	40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	⅛ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	37
18.	.049.	..	..	..	..	33	30	29	28	25	26	26	26	..	..	..	..	..
20.	.035.	117	..	46	30	34	33	32	30	29	30	30	30	31	38	40	58	81
21.	.032.	..	..	..	40	..	..	..	..	..	..	..	..	..	..	..	..	..
22.	.028.	138	98	48	42	38	37	35	34	..	..	45	..	..	..	..	..	..
24.	.022.	188	133	108	88	79	73	62	60	66	..	..	..	..	..	..	..	..

Prices are for ten or more pounds at one time. For prices on sizes not carried in stock send for Manufacturers' List.

PRICE LIST FOR ALUMINUM ROD AND WIRE.

Diameter. B. & S.G'ge.	000 to No. 10.	No. 11.	No. 12.	No. 13.	No. 14.	No. 15.	No. 16.	No. 17.	No. 18.	No. 19.	No. 20.	No. 21.	No. 22.
Price, per lb....	32	32½	32½	33	33½	34	34½	35	36	37	38	43	46

PRICE LIST FOR GERMAN SILVER IN SHEETS AND ROLLS.

Per cent.	Price per lb.	Per cent.	Price per lb.
12	$0.52	16	$0.58
13	.53	17	.59
14	.54	18	.90
15	.55		

These prices are for sheets and rolls over 2 inches in width, to and including 8 inches in width and to No. 20, inclusive. American or Brown & Sharpe's Gauge. Prices are for 100 lbs. or more of one size and gauge in one order. Discount 50%.

GERMAN SILVER TUBING.

4 per cent.	to No. 19,	B. & S.	Gauge, inclusive	$0.60
6 "	" 19,	"	"	.70
9 "	" 19,	"	"	.85
12 "	" 19,	"	"	1.00
15 "	" 19,	"	"	1.15
16 "	" 19,	"	"	1.20
18 "	" 19,	"	"	1.30

German Silver Tubing thinner than No. 19 B. & S. Gauge add same advances as for Brazed Brass Tube.

For cutting to special lengths add same advances as for Brazed Brass Tube. Discount 40%.

PRICES OF SHEET SILVER.

Rolled sterling silver .925 fine is sold according to gauge quantity and market conditions. No fixed quotations can be given, as prices range from 2c. below to 6c. above the price of bullion.

Rolled silver anodes .999 fine are quoted at 2c. to 3½c. above the price of bullion.

ALUMINUM COMPANY OF AMERICA

PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

Branch Offices

NEW YORK—99 John St.
BOSTON—131 State St.
CHICAGO—Old Colony Bldg.
PITTSBURGH—2344 Oliver Bldg.
PHILADELPHIA—320 Witherspoon
ROCHESTER—406 Powers Bloc
CLEVELAND—719 Garfield Bl
WASHINGTON—514 Nat. Me
DETROIT—1515 Ford Bldg.

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ew York
mes
ıdustry for 1910
$2.00

Metal Prices, October 9, 1911

PRICES ON BRASS MATERIAL—MILL SHIPMENTS,

In effect July 1, 1911, and until further notice.

To customers who purchase less than 40,000 lbs. per year and over 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.13⅜	$0.14¾	$0.15⅞
Wire	.13⅝	.14¾	.15⅞
Rod	.13⅝	.15⅛	.16⅞
Brazed tubing	.18½	—	.20⅝
Open seam tubing	.16½	—	.18⅝
Angles and channels, plain	.16¾	—	.18⅝

50% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

To customers who purchase less than 5,000 lbs. per year.

	Net base per lb. High Brass.	Low Brass.	Bronze.
Sheet	$0.14⅝	$0.15¾	$0.16⅞
Wire	.14⅝	.15¾	.16⅞
Rod	.14⅝	.16½	.17⅞
Brazed tubing	.19½	—	.21⅝
Open seam tubing	.17½	—	.19⅝
Angles and channels, plain	.17¾	—	.19⅝

5% discount from all extras as shown in American Brass Manufacturers' Price List No. 8.

NET EXTRAS FOR QUALITY.

Sheet—Extra spring, drawing and spinning brass	½c.	per lb. net advance
" —Best spring, drawing and spinning brass	1½c.	" " " "
Wire —Extra spring and brazing wire	½c.	" " " "
" —Best spring and brazing wire	1c.	" " " "

BARE COPPER WIRE—CARLOAD LOTS.

13.50 per lb. base.

SOLDERING COPPERS.

300 lbs. and over in one order	17½c.	per lb. base
100 lbs. to 300 lbs. in one order	18c.	" " "
Less than 100 lbs. in one order	19½c.	" " "

PRICES FOR SEAMLESS BRASS TUBING.

From 1¼ to 3½ in O. D. Nos. 4 to 13 Stubs' Gauge, 18c. per lb.
Seamless Copper Tubing, 21c. per lb.

For other sizes see Manufacturers' List.

PRICES FOR SEAMLESS BRASS TUBING Iron Pipe Sizes.

Iron pipe Size	⅛	¼	⅜	½	¾	1	1¼	1½	2	2½	3	3½	4	4½	5	6
Price per lb.	28	25	20	19	18	18	18	18	18	18	18	19	20	22	24	25

PRICE LIST OF IRON LINED TUBING—NOT POLISHED.

	Per 100 feet Brass.	Bronze.
⅜ inch	$8	$9
½ inch	8	9
⅝ inch	10	11
¾ inch	12	13
⅞ inch	14	15
1 inch	18	20
1¼ inch	22	24
1¼ inch	25	27
1½ inch	32	35
1¾ inch	45	48
2 inch	56	60

Discount 55 and 5%.

PRICES FOR TOBIN BRONZE AND MUNTZ METAL.

Tobin Bronze Rod		16c.	net base
Munts or Yellow Metal	Sheathing (14" x 48")	14c.	" "
" " "	Rectangular sheets other than Sheathing	16c.	" "
" " "	Rod	14c.	" "

Above are for 100 lbs. or more in one order.

PLATERS' METALS.

Platers' bar in the rough, 22⅝c. net.

German silver platers' bars dependent on the percentage of nickel, quantity and general character of the order.

Platers' metal, so called, is very thin metal not made by the larger mills and for which prices are quoted on application to the manufacturers.

PRICES FOR SHEET BLOCK TIN AND BRITANNIA METAL.

Not over 18 in. in width, not thinner than 23 B. S. Gauge, 2c. above price of pig tin in same quantity.

Not over 35 in. in width, not thinner than 22 B. S. Gauge, 3c. above price of pig tin.

PRICE SHEET FOR SHEET ALUMINUM—B. & S. Gauge.

Wider than..... and including.....	3in. 12in.	6in. 14in.	14in. 16in.	16in. 18in.	18in. 20in.	20in. 24in.	24in. 30in.	30in. 36in.	36in. 40in.
	in coils.								
No. 13 and heavier	34	34	36	36	36	36	39	39	39
" 14	34	34	36	36	36	36	39	39	39
" 15	34	34	36	36	36	36	39	39	39
" 16	34	34	36	36	36	36	39	39	39
" 17	34	34	36	36	36	36	39	39	39
" 18	34	34	36	36	36	36	39	39	42
" 19	34	34	36	36	36	36	39	40	43
" 20	34	36	36	36	36	38	41	42	44
" 21	34	38	38	38	38	40	43	44	50
" 22	34	38	38	38	40	40	43	47	51
" 23	34	38	38	38	40	40	43	49	52
" 24	34	38	40	42	42	42	45	51	54
" 25	36	39	41	43	43	43	46	53	57
" 26	36	39	42	46	46	46	51	55	61
" 27	36	40	44	48	48	49	54	58	64
" 28	36	40	46	48	49	49	56	62	67
" 29	38	41	48	50	52	52	61	67	72
" 30	38	42	50	52	56	62	69	72	77
" 31	43	47	55	58	63	71	74	77	83
" 32	45	49	57	61	69	77	91	90	95
" 33	47	51	60	65	73	84	91	100	110
" 34	50	55	62	70	78	91	103	110	120
" 35	..	65	70	80	90	100	115	125	..
" 36	..	80	90	100	115	120	135	..	..
" 37	..	104	114	129	144	159	174	..	..
" 38	..	124	139	154	169	184	204	..	..
" 39	..	144	164	184	204	224	..	..	..
" 40	..	174	204	224	244	..	..	..	..

In flat rolled sheets the above prices refer to lengths between 2 and 3 feet. Prices furnished by the manufacturers for wider and narrower sheet. All columns except the first refer to flat rolled sheet. Prices are 100 lbs. or more at one time. Less quantities 5c. lb. extra. Charges made for boxing.

PRICE LIST SEAMLESS ALUMINUM TUBING.

STUBS' GAUGE THE STANDARD. SIZES CARRIED IN STOCK.
Outside Diameters. BASE PRICE, 25 Cents per Pound.

Stubs' Gauge.	Inches.	¼ in.	5-16 in.	⅜ in.	½ in.	⅝ in.	¾ in.	⅞ in.	1 in.	1¼ in.	1½ in.	1¾ in.	2 ins.	2½ ins.	3 ins.	3½ ins.	4 ins.	4½ ins.
11.	.120.	..	..	..	..	..	..	..	27	24	..	..	14	20	10	9	16	23
12.	.109.	..	..	..	..	..	..	..	26	..	..	..	15	..	..	..	..	..
14.	.083.	..	..	..	..	..	..	..	..	..	..	..	17	..	..	..	..	..
16.	.065.	..	..	..	..	..	28	27	27	24	23	21	21	21	21	27	31	57
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20.	.035.	117	..	46	39	34	33	32	30	29	30	30	30	31	38	49	58	81
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PITTSBURGH, PA.

ALUMINUM

SHEET TUBING
EXTRUDED SHAPES
ROD RIVETS WIRE
ELECTRICAL CONDUCTORS

Branch Offices

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PHILADELPHIA—320 Witherspoon
ROCHESTER—406 Powers Bloc
CLEVELAND—719 Garfield Bld
WASHINGTON—514 Nat. Me
DETROIT—1515 Ford Bldg.

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Our Ingot is prepared by the most up-to-date methods, which insures good, free-flowing metal. Send us your specifications and we will quote you prices which are sufficiently below the cost of making the same composition from new metals, that a material saving can be effected. We are in position to do this, as we have our own smelters. Our Ingots are guaranteed subject to chemical analysis within 1% either way of aimed-at formula.

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Branch Plant BIRMINGHAM, ALA

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Efficiency

in

Bearing Bronze

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The new metal that looks like gold and wears like steel. *Absolutely won't corrode.* Resists the action of the atmosphere, salt air and salt water. *Color and lustre permanent.* Great strength, toughness and ductility. *The easiest metal to work known.* Can be had either soft or of hard spring temper. For fittings of all kinds. *No lacquer required. Easily cleaned with soap and water.* Some of its principal uses are: for jewelry, bedsteads, automobile fittings, ship's fittings, building hardware, furniture trimmings, railroad car fittings, lamps, lavatory fittings, chandeliers, etc. In ingots, sheet, wire, tubing and rods.

JAMES SAVAGE & COMPANY, *Brass Founders, Brooklyn, N. Y., wrote:* "It is the most wonderful metal of the non-ferrous class. I cast a rod ¾" x 12" long, and you can forge and bend it in any way you desire. Two expert molders paid me a visit, and I showed them the new metal and torsion test I made, and they admitted they had no mixture that would come near the test I made. It turns on the lathe like steel, and you can hammer it to a razor edge."

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...s. Institute of Technology, test 11,090 lbs. per sq. inch at soldered joint

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$100 REWARD

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... have repaired tons of Aluminum

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N. Y. AGENCY
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Pittsburgh, Pa.

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No Order too Small, Prompt Delivery
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Pure Aluminum in Sheets and Foil to thinness of $\frac{1}{1000}$ of an inch. Aluminum in Ingots, Sheets, Rods, Wire and Tubing. Aluminum Solder and Rivets. Platers' Silver and Battery Plate 999 Fine. Platers' Brass, Oreide and German Silver.

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Bronze Liquid for Mixing the Powder
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SPELTER, LEAD, ANTIMONY
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SEAMLESS DRAWN BRASS AND COPPER TUBING
BRASS { SHEET ROD WIRE
COPPER { SHEET ROD WIRE
GERMAN SILVER { SHEET ROD WIRE
At Waterbury

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Copper and Yellow
(MUNTZ) METAL
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NAVAL BRONZE
MANGANESE BRONZE
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BRAZED BRASS TUBING
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BRIDGEPORT BRASS CO.
Manufacturers BRIDGEPORT, CONN.

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for Bearings
LINING METAL
for Automobiling Bearings and Copper for Electrical Purposes
H. K. & F. S. Benson
GLEN RIDGE, N. J.

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SEYMOUR, CONN.
German Silver
Brass, Copper and Bronze in Sheets, Wire, Rods and Tubes
COPPER AND NICKEL ANODES
Phosphor Bronze

A. H. Wells & Co.
WATERBURY, CONN.
Manufacturers of
SEAMLESS... **Tubing**
NICKEL SILVER, BRASS, COPPER, BRONZE AND PURE COPPER
TUBING FOR ELECTRICAL PURPOSES
Odd and Special Shapes, and Small Tubing a Specialty
—Also the—
BOURDON STEAM GAUGE SPRINGS
All Sizes from 8 to 36, B. & S. Gauge.

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CASTING, ROLLING and REFINING FOR THE TRADE
Standard Rolling Mills Inc.
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BROOKLYN, N. Y.

LINTON & CO.
95 Pine Street PROVIDENCE, R. I.
MANUFACTURERS OF
Gold Solder
SHEET OR WIRE
Silver Solder
SHEET OR WIRE
Sheet Brass Solder

"RIVERSIDE"
GERMAN SILVER
PHOSPHOR BRONZE
Sheets, Rods, Wire, Ingots, Castings, Jewelers' Bars and Alloys.
The
Riverside Metal Co.
Riverside Burlington Co., N. J.

DIRECTORY

METAL ROLLING MILLS.

INGOT, PLATE, SHEET, ROD, WIRE, TUBE, METAL GOODS.

The Michigan Copper and Brass Company

Manufacturers of "Wolverine" Brass
In Sheets and Rolls, Rods, Wire and Tubing.

Low Brass, Bronze and Oreide
In Sheets and Rolls, Rods, Wire and Tubing.

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In Sheets and Rolls.

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James E. Danaher, Vice President.
D. M. Ireland, Second Vice President.
Geo. H. Barbour, Jr., Treasurer.
Benj. F. Brusstar, General Supt.
Charles Sparks, Manager of Sales.

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Manufacturers of
BRASS and COPPER Sheets, Tubes Rods and Wire
Sole Manufacturers TOBIN BRONZE
(Trade-Mark Registered)

MANHATTAN BRASS COMPANY
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Manufacturers of
BRASS and BRONZE in Sheet, Rod Wire, Tube, Moulding, etc. METAL GOODS made to order from Brass, Bronze and Copper.

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BUFFALO, N. Y.

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WATERBURY, CONN.
Manufacturers of
ROLLED BRASS, BRONZE, GERMAN SILVER AND COPPER IN THIN GAUGES. PLATERS' METAL.

SEAMLESS STEEL TUBING
From 4 in. Diameter to 1-64 in.
Finished Bright, Smooth and Accurate to 1-1000 Ins. Inside and Out
Tool Steel Tubing. Soft Steel Tubing. Also Small Brass, Copper and Aluminum Tubing.
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Oak Lane Station, Philadelphia, Pa.

PHENIX TUBE CO.
Manufacturers of
Brass and Bronze Iron Lined Tubes
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Round and Square
Main Office and Mills: Brooklyn, N. Y. City Branch Offices: Chicago, San Francisco

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Rolled Fireless Sterling Silver
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DIRECTORY

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LA SALLE, ILLINOIS
SMELTERS of SPELTER
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SHEET ZINC and SULPHURIC ACID
Zincs for Leclanche Battery
Special Sizes of Zinc to order. Rolled Battery Plates. Selected Plates for Etchers' and Lithographers' use. Selected Sheets for Paper and Card Makers' use. Stove and Washboard Blanks.

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THE ORIGINAL BRAND OF PURE SPELTER
Indispensable in the manufacture of
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The New Jersey Zinc Co.
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Manufacturers of
SPELTER, SHEET ZINC, and SULPHURIC ACID
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W. FISHER
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Telephone, 139 Beekman

High-Grade Spelter and Sulphuric Acid

HEGELER BROTHERS, DANVILLE, ILL.

Sandoval Zinc Company
Smelters of
HIGH GRADE SPELTER AND PIG LEAD
Chemical Department
East St. Louis
General Offices:
410 North Peoria Street
CHICAGO, ILLS.
Works: Sandoval and East St. Louis, Illinois.

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Cold Rolled Zinc
IN COILS FOR DRAWING and STAMPING
The Platt Bros. & Co.
WATERBURY, CT.

DIRECTORY

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Dealers in New and Old Metals, and the Largest Buyers of Zinc Dross, Skimmings, Sal Skimmings, Scrap Zinc and Aluminum

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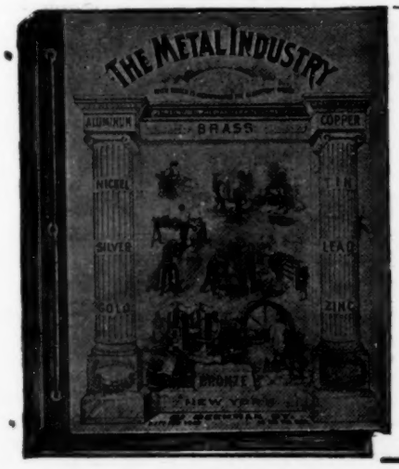

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One CARD DYNAMO, 1000 amperes, 6 volts. Has been used for about six years and is in very good working condition. The Armature should be turned. We are asking $125, but may be able to shade this figure. Write for full particulars. Address, CARD DYNAMO, care THE METAL INDUSTRY.

FOR SALE—A process of Casting Pure Aluminum from the heaviest to the finest work without cracking. The perfection of this process will be satisfactorily demonstrated. Address ALUMINUM PROCESS, care THE METAL INDUSTRY.

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J. P. FANNING, machinist, 678 Jefferson avenue, Brooklyn, N. Y.—Maker of Moulds for Casting Solder, Babbitt Metal, Bar Lead, etc. We also manufacture small work. Write for particulars.

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FOR SALE—Three Schwartz FURNACES in first-class running condition. Apply STANDARD SANITARY MFG. COMPANY, Louisville, Ky.

FOR SALE—GAS PRODUCER ENGINE. A 105 h.p. "Otto" gas producer engine with dynamo and switchboard and electrical equipment complete. Erected one year ago. No expense was spared to make it a model installation. Particulars and description can be found on page 120 of March number of THE METAL INDUSTRY, or can be inspected upon application. THOMAS A. PAINTER, 79 Eighth avenue, New York, N. Y.

FOR SALE—Opportunity: Brass tubing; 1 inch, 18 B. W. G., 500 lbs. Suitable for electric portables, gas fixtures. H. F. FRASSE, P. O. Box 801, Brooklyn, N. Y.

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FOR SALE—An up-to-date JOB PLATING SHOP located in a western New York city of 225,000 population. Business established 1887. Must be sold. Address JOB PLATING SHOP, care THE METAL INDUSTRY.

FOR SALE—One of the largest JOB PLATING plants in New York State, running fifteen years; facilities strictly up to date and everything new. Plenty of work on hand; guarantee large profits. Will bear strict investigation. Best reasons for selling. Will consider time payments. Address EXTRAORDINARY OPPORTUNITY, care THE METAL INDUSTRY.

FOR SALE OR LEASE—BRASS AND ALUMINUM FOUNDRY in Indianapolis, Ind. Thoroughly modern in equipment and appliances. Did a business in its last year of nearly $200,000.00. Second largest automobile center in United States. Nearly thirty auto factories in city and vicinity. Great quantities of brass and aluminum castings required here and within a radius of one hundred miles. Present owner engaged in other business requiring his time. Address F. E. JANES, care F. E. JANES COAL & GRAIN COMPANY, INDIANAPOLIS, IND.

FOR SALE—BRASS FOUNDRY in Brooklyn, N. Y., fully equipped and running at the present time. Good line of paying business. Owner engaged in other business requiring his time. Address X Y Z, care THE METAL INDUSTRY.

FOR SALE—PLATING and POLISHING SHOP, the only one in city. At the present time doing good business. Reason for selling, other business. Cheap to quick buyer. Address PLATING SHOP, care THE METAL INDUSTRY.

FOR SALE—ELECTRO-PLATING PLANT doing a good business in the heart of the city of Boston. Good reasons for selling. WINTHROP PLATING COMPANY, 34 Beach street, Boston, Mass.

FOR SALE—Good paying BRASS MANUFACTURING ORNAMENTAL METAL and PLATING WORKS; fully equipped; long lease; cheap rent; established thirty years; wants to sell on account of sickness; will sacrifice for $9,000, at least half cash. Address BOX 1, care THE METAL INDUSTRY.

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RUST PROOF BLACK FORMULA. ¶ For full particulars address ¶ Wm. Schneider, ¶ Care of THE METAL INDUSTRY, ¶ 99 John Street, New York.

WANTED

METALS, MACHINERY AND SUPPLIES

WANTED—A 10 h. p. UPRIGHT BOILER. Must be in good condition and at low cost. Address S-1, care THE METAL INDUSTRY.

WANTED—Second-hand 6 or 8 h. p. horizontal engine and boiler. State what make, condition and price. Address HORIZONTAL, care THE METAL INDUSTRY.

AGENCY

WANTED—The Agency for some American Hardware firms in England. Address HARDWARE, care THE METAL INDUSTRY.

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INQUIRIES

Inquiries received by THE METAL INDUSTRY for Metals, Machinery and Supplies. Further particulars may be obtained by addressing the inquiry number, care THE METAL INDUSTRY. No charge for inserting these inquiries.

Inquiry No. 357—We would like information about a sand-blasting machine for brass foundry work.

Inquiry No. 358—We have a quantity of scrap nickel for sale and would like to hear from firms who are interested in purchasing this material.

Inquiry No. 359—We are in the market for a small plating generator 100 amperes—6 volts. Will consider second hand machine if in good condition.

Inquiry No. 360—I would like to locate some supply of used cotton goods, canvas or other similar material suitable for cutting into 6-inch circular buff discs.

Inquiry No. 361—I would like to correspond with firms who manufacture faucets made of clay. They are used for acid.

Inquiry No. 362—We would like to correspond with the manufacturers of melting furnaces for aluminum and its alloys. A size of furnace capable of handling from fifty to two hundred pounds of metal at one time.

Inquiry No. 363—We would like to correspond with the manufacturers of a white metal sweating or melting furnace.

Inquiry No. 364—We would like to correspond with firms who handle potassium persulphate.

Inquiry No. 365—I would like to correspond with firms that make ornamental electric lamps, in the form of grapes, etc.

Inquiry No. 366—We would like to correspond with the manufacturers of brass foundry riddles.

Inquiry No. 367—We would like to correspond with manufacturers of machinery for grinding belt leather into leather meal.

Inquiry No. 368—We would like to correspond with firms who can furnish lead coated copper sheets.

Inquiry No. 369—We would like to correspond with the manufacturers of equipment for gold coloring.

Inquiry No. 370—We would like to correspond with firms who handle steel sheets enamelled.

Inquiry No. 371—We would like to correspond with foundries who sell bronze busts.

Inquiry No. 372—We would like to correspond with the manufacturers of welding torches.

Inquiry No. 373—We would like information in regard to a steam generator for our plating room. We shall be pleased to receive circulars from generator manufacturers.

Inquiry No. 374—We would like to correspond with the manufacturers of Kester Soldering Salts.

Inquiry No. 375—We would like to correspond with the manufacturers of a crucible furnace, capacity 15 lbs., gas fired, for laboratory purposes, that will give a heat of 3,300 deg. Fahr.

Inquiry No. 376—We would like to correspond with firms who are headquarters for mercury. Also lead sulphide (pure galena).

Inquiry No. 377—We would like to correspond with firms who can furnish us with blue grit, used for cutting down silverware.

Inquiry No. 378—I would like the names of parties who make molds for novelty work, small statues, etc.

SITUATIONS OPEN

SHEET METAL SHOP

WANTED—METAL FOREMAN experienced in handling men and capable of drawing steel No. 24 U. S. and No. 28 U. S., and familiar with machine and hand spinning. State full particulars and give reference. Excellent opportunity for a thorough mechanic who can produce results. Address MACHINE SPINNING, care THE METAL INDUSTRY.

WANTED—PRESS DEPARTMENT FOREMAN. A mechanic who thoroughly understands the operating and capacity of single and double acting drawing presses. Must have a good knowledge of the operating and handling of dies for forming light gauge metal. Plant is small, but growing rapidly. An excellent opportunity. Address DRAWING PRESSES, care THE METAL INDUSTRY.

BRASS FINISHING DEPT.

WANTED—First class help, such as MONITOR HANDS and MACHINE SETTERS, foreman in our BRASS FINISHING DEPARTMENT and a first class CLERK on BRASS; somebody with plenty of experience. We also want a first class CORRESPONDENCE CLERK, one that has plenty of energy and push. Address BRASS SHOP, care THE METAL INDUSTRY.

BRASS MOLDER

WANTED—MOLDER for small BRASS FOUNDRY just starting in Newark, N. J. Must be man familiar with general jobbing work and understand all details of SAND MOLDING, METAL MIXING, ETC. State age, experience and references as to character and ability. Address NEWARK, care THE METAL INDUSTRY.

DIE CASTER

WANTED—A MANAGING SUPERINTENDENT capable of taking complete charge of a DIE CASTING PLANT in CANADA, preferably one who can become interested financially and act as director. Address CANADA MANAGER, care THE METAL INDUSTRY.

SITUATIONS WANTED

Advertisements Under This Heading 50 Cents Each Insertion.

EXECUTIVE

SITUATION WANTED—ARCHITECTURAL BRONZE and IRON—Am thoroughly conversant with the handling of architectural bronze in all its branches from prospect to complete installation. First class working knowledge of Estimating, Drafting, Manufacture and Simple System. Would like to locate permanently in a responsible position with up-to-date concern requiring the service of one who can deliver. Address R. H. T., care THE METAL INDUSTRY.

SITUATION WANTED—By an Expert Cost Accountant, Cashier, Paymaster, also Purchasing Agent. Have had eight years' experience with one of the leading plating supply houses, both in office and as salesman. Can furnish the best of references. Address EXPERT ACCOUNTANT, care THE METAL INDUSTRY.

SITUATION WANTED—I am desirous of making a change in September. For the past four years I have been GENERAL MANAGER of a leading plant making PLUMBING SUPPLIES, and previous seven years general office and factory experience. Age 31, married, active, energetic and thoroughly capable. Correspondence solicited and references exchanged. Address PLUMBING MANAGER, care THE METAL INDUSTRY.

SITUATION WANTED—BRASS FOUNDRY SUPERINTENDENT or FOREMAN. Thoroughly experienced on ALUMINUM CASTINGS for automobiles, valve pump and general jobbing lines. Thirty-two years old, temperate and a hustler. Well up on molding machines and mixing metals. Address 0-2, care THE METAL INDUSTRY.

PROFESSIONAL

SITUATION WANTED—CHEMICAL ENGINEER of two years' experience wishes to communicate with a BRASS FOUNDRY desiring a college man who has both business and technical experience and who makes a specialty of Manganese Bronze and Aluminum. Address INGOT, care THE METAL INDUSTRY.

ROLLING MILL EXPERTS

SITUATION WANTED—I am desirous of making a change from my present position. Would like to get in communication with parties in need of a man capable of taking charge of all or any department of a BRASS and COPPER MILL. Reference furnished. Address AMERICAN, care THE METAL INDUSTRY.

SITUATION WANTED—As ROD ROLLER in Brass Rod Mill. Have had charge of a rod mill for years. Can furnish the best of reference. Address ROD ROLLER, care THE METAL INDUSTRY.

PATTERN MAKER

SITUATION WANTED—FOREMAN METAL PATTERN MAKER experienced on steam specialties and plumbers' brass goods, also the manufacture of general brass goods. Address B, care THE METAL INDUSTRY.

FOUNDERS

SITUATION WANTED—Young man who understands the making of MANGANESE BRONZE, PHOSPHOR BRONZE, GUN METAL and a number of other metals and alloys desires position. Address M. E. K., care THE METAL INDUSTRY.

SITUATION WANTED—By a first-class FOUNDRY FOREMAN; 30 years' experience on all classes of work, including plumbers' supplies, valves, automobile and jobbing. Can handle help to advantage. Also knows all saving devices for melting and molding and mixing metals from lead to gold. Address P. B. O., care THE METAL INDUSTRY.

SITUATION WANTED—Young man who is familiar with the manufacture of high tensile metals and alloys, desires a position. Address K., care THE METAL INDUSTRY.

SITUATION WANTED—By a BRASS FOUNDRY FOREMAN. Can do my own mixing, and can handle crucible or Schwartz furnaces. Can also control help, and molding machines to advantage in the manufacture of valves, cocks, fittings, etc. Address B. F., care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN CHANDELIER or ARCHITECTURAL BRONZE CONSTRUCTION. Factory or outside position. Capable of handling men to best advantage. Would also consider salesmanship with well established house. Address D. E., care THE METAL INDUSTRY.

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SITUATIONS WANTED—Continued

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FOUNDERS—Continued

SITUATION WANTED—By a PLASTER COMPOSITION FOUNDRYMAN with 9 years' experience at fine arts castings in metals, plaster, wax and glue; also for patterns for engraving machines. Address P. C. F., care THE METAL INDUSTRY.

SITUATION WANTED—By ALUMINUM FLOOR MOLDER thoroughly familiar with heavy and light work. Have had 19 years' experience. Address N. J., care THE METAL INDUSTRY.

STEAM AND ELECTRICAL ENGINEER

SITUATION WANTED—By a practical STEAM and ELECTRICAL ENGINEER, 2nd class N. Y. license; wishes steady employment. Holding a responsible position for the last 8 years with a large modern electrical plant. Good reference; capable of taking charge. Address T. S., care THE METAL INDUSTRY.

BRASS FINISHER

SITUATION WANTED—FOREMAN BRASS FINISHER, practical mechanic who has had foreman's experience and well versed in the up-to-date methods of manufacture of plumbers' and steamfitters' supplies; repair jobbing and specialty work; 18 years' experience; good references. Address FOREMAN BRASS FINISHER, care THE METAL INDUSTRY.

ETCHER

SITUATION WANTED—Thoroughly practical transfer etcher on silver, brass, copper and organic substances, desires to make a change. Good recommendations. Address X. T., care THE METAL INDUSTRY.

PLATERS AND POLISHERS

ELECTROPLATERS

Any one desiring the services of first class men for the electro-deposition of metals and finishing in all branches and departments of the plating business can secure such services by corresponding with the Secretary of the National Electro-Platers' Association, Royal F. Clark, 246 Fulton Avenue, Jersey City, N. J.

SITUATION WANTED—By a PLATER 30 years of age, with 5 years' experience on CHANDELIERS and 6 years' on jobbing work. Please give full details of position. Address K. J., care THE METAL INDUSTRY.

SITUATION WANTED—PLATER, BUFFER and POLISHER, now working, desires position in the East where mental effort and ability would be tolerated. Plates in copper, brass, bronze, nickel, silver, gold platinum, zinc and tin. Makes all chandelier, hardware and art metal finishes. Can install economic and efficient system. Address EXPERT PLATER, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER with several years' experience on Nickel, Brass, Copper, Bronze Solutions, oxidizing and dipping. Address J-23, care THE METAL INDUSTRY.

SITUATION WANTED—By a GILDER EXPERT on shades of GOLD COLORING. Age 35. Position in Newark or New York City preferred. Address JEWELRY, care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER. First-class man on nickel, brass, copper, silver, black nickel; understands all hardware finishes, etc. Address N-2, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who is up to date on all finishes and colors. Desires a position with a good firm. Salary $30 per week. Address D-1, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who thoroughly understands the plating business from A to Z. Has had several years' experience and is capable of taking charge. Address P. H., care THE METAL INDUSTRY.

SITUATION WANTED—By a PLATER having had ten years' experience on all metals and finishes. Can furnish best of reference. Address CONNECTICUT, care THE METAL INDUSTRY.

SITUATION WANTED—By an ELECTRO-PLATER, 18 years' experience with Nickel, Copper, Brass and Bronze solutions and oxidizing. Can furnish good reference. Address BOX M-9, care THE METAL INDUSTRY.

SITUATION WANTED—By a FOREMAN PLATER who is up-to-date on all new colors and old finishes. Can do anything in plating. Expert at matching colors. Experienced on lamps, hotel work and chandeliers. Greater New York preferred. Address B. R. K., care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN PLATER, POLISHER and BUFFER with a wide experience, now employed, would make a change. Steady position desired. Address H. G. S., care THE METAL INDUSTRY.

SITUATION WANTED—FOREMAN PLATER desires position. Can handle all solutions, but have made a specialty of Brass, Nickel and Copper, also Acid Copper on Iron. No plant too large. Familiar with Barrel Plating. Highest references. Address G. C. T., care THE METAL INDUSTRY.

SITUATION WANTED—As ELECTRO-GILDER and PLATER. Holloware, Novelties, Soda Fountains, Jobbing and Sterling Silverware. Address S. F. D., care THE METAL INDUSTRY.

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BOOKS ON METALS

BOOKS ON PLATING

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See Pages 53 and 54.

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The Manufacture of Shot	"
The Manufacture of Pure Copper Castings	"
High Speed Production in the Brass Shop (Continued)	"
The Manufacture of Wrought Brass (Continued)	"
The Naugatuck Valley Brass Trade, Its Origin and Progress	"
Manufacture of Hollow Brass Bodies by Extrusion	"
The Designing and Production of Art Metal Novelties	"
Zinc-Hardened Aluminum Versus Copper-Hardened Aluminum for Making Aluminum Castings	"
Making Cores on Molding Machines	"
Modern Bronzes (Continued)	"
Gold and Silver in Waste Materials	"
A Practical Acid Copper Bath with Directions for Its Operation	"
How to Overcome the Streaking of an Acid Copper Deposit	"
Deadly Parallels in Cost Accounting	"
The Production of the Ring Mesh Purse	"
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Leaves from a "Scrap" Book	"
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Bronze Tubes (See Brass, Bronze and Copper Tubes).

Brushes, Wire and Bristle (See also Foundry Supplies and Platers' Supplies).
Blumenthal, Hermann, New York.
Kelly, T. P., & Co., New York.
Manufacturers' Brush Co., Cleveland, O.
Osborn Manufacturing Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Riehl Manufacturing Co., Cleveland, O.

Buckle Tongues.
Campbell-Warner Co., Middletown, Conn.

Buffing Compositions (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.
Emery Candle Co., Cincinnati, O.

Buffing and Polishing Supplies (See Polishing and Buffing Machinery and Equipment).

Buffing and Polishing Wheels (See also Platers' Supplies).
Divine Brothers Co., Utica, N. Y.

Bull-Dozers
Wood, R. D., & Co., Philadelphia, Pa.

Burners, Fuel Oil or Gas (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Jersey City, N. J.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Burnishing Barrels (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Baird Machine Co., Oakville, Conn.
Globe Machine & Stamping Co., Cleveland, O.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.

Burnishing Barrels, Leather Meal for
Peckham Mfg. Co., Newark, N. J.

Burnishing Compounds and Chips (See also Platers' and Polishers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Emery Candle Co., Cincinnati, O.
Haas Bros. Supply Co., Newark, N. J.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.

Cabbaging Presses.
Farrel Foundry & Machine Co., Ansonia, Conn.
Wood, R. D., & Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.

Cadmium, Metallic
Grasselli Chemical Co., Cleveland, O.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Richards & Co., Boston, Mass.

Carboy Rockers.
Rockhill & Vietor, New York.

Castings. (See also name of metal wanted).

Castings, Iron Machinery
Bliss Co., E. W., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.

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Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Caustic Potash (See Platers', Polishers' and Galvanizers' Supplies).

Centrifugal Dryers and Extractors
American Tool & Machine Co., Boston, Mass.
Tolhurst Machine Works, Troy, N. Y.

Chaplets, Perforated (See Foundry Supplies).

Chemicals (See Platers' Supplies).

Chromium Bronze.
Naulty Smelting & Refining Co., Philadelphia, Pa.

Chucks.
American Tool & Machine Co., Boston, Mass.

Chucks, Spinning
Bliss, E. W., Co., Brooklyn, N. Y.
Pryibil, P., New York.

Cock Grinder, Automatic
Turner Machine Co., Philadelphia, Pa.

Composition Metal Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Buermann Mfg. Co., August, Newark, N. J.
Damascus Bronze Co., Pittsburgh, Pa.
Eastern Metal & Refining Co., Boston, Mass.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
White & Bro., Inc., Philadelphia, Pa.

Composition Metal Tacks, Nails, Etc.
Hussey, C. G., & Co., Pittsburg, Pa.

Conveyors.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Copper, Carbonate of
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.

Copper Castings.
American Manganese Bronze Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.

Copper Ingots.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Brothers, New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.
Taunton-New B'f'd Copper Co., New Bedford, Mass.
White & Bro., Inc., Philadelphia, Pa.

Copper Nails and Tacks.
Hassall, John, Inc., New York.
Hussey, C. G., & Co., Pittsburg, Pa.
Scovill Manufacturing Co., Waterbury, Conn.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Copper Rivets.
Hassall, John, Inc., New York.
Hendricks Bros., New York.

Copper Sheets, Wire, Rods, Bolts, Etc. (See Brass, Bronze and Copper Sheets, etc.)

Copper, Shot
Seymour Manufacturing Co., Seymour, Conn.

Copper, Sulphate of
Apothecaries Hall Co., Waterbury, Conn.
Grasselli Chemical Co., Cleveland, O.

Copper Tubes (See Brass and Copper Tubes)

Core Compound (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederick B., Detroit, Mich.

Core Machines and Core Tapering Machines. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, W. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Core Ovens (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Gehnrich, Hermann, New York.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Smith, J. D., Foundry & Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Cosletilizing.
Flavell, E. A., New Britain, Conn.

Cranes.
Detroit Foundry Supply Co., Detroit, Mich.

Crucibles, Stirrers, Stoppers, Nozzles, Etc. (See also Foundry Supplies).
Bartley, Jonathan, Crucible Co., Trenton, N. J.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Gautier, J. H., & Co., Jersey City, N. J.
McCullough-Dalzell Crucible Co., Pittsburgh, Pa.
Paige Retort & Crucible Co., Taunton, Mass.
Ross-Tacony Crucible Co., Philadelphia, Pa.
Taylor, R. J., Inc., Philadelphia, Pa.

Crushers, Cinder (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Farrel Foundry & Machine Co., Ansonia, Conn.
Moussette, O. J., Co., Brooklyn, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Cupror Metal.
Non-Corroding Metal Co., New York.

Cyanide of Potassium (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.

Dies, Sheet Metal Working
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Globe Machine Stamping Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Draw Benches—Wire, Rod and Tube
Farrel Foundry & Machine Co., Ansonia, Conn.
Lelman Bros., New York.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Drosses (See Metal Turnings, Drosses, etc.).

Drying-Out Machines.
Baird Machine Co., Oakville, Conn.
Smith & Richardson, Attleboro, Mass.
Tolhurst Machine Works, Troy, N. Y.
Torrington Mfg. Co., Torrington, Mass.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Dust Collectors and Ventilating Systems.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Kirk & Blum, Cincinnati, O.
Knickerbocker Co., The, Jackson, Mich.
Lelman Bros., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Dynamos, Platers' and Galvanizers' (See also Platers' Supplies).
Backus & Leeser Co., New York.
Bennett-O'Connell Co., Chicago, Ill.
Bogue, Chas. J., Electric Co., New York.
Canning, W. Co., Birmingham, England.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Lelman Bros., New York.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Munning-Loeb Co., Matawan, N. J.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Stevens, Frederic B., Detroit, Mich.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Elaine (Red Oil).
Emery Candle Co., Cincinnati, O.

Electric Cleaning Compounds (See Metal Cleaning Compounds).

Electroplaters' Centrifugal Dryers
Tolhurst Machine Works, Troy, N. Y.

Electroplating, Polishing, Coloring, Etc.
Electro Bronze Co., Arlington, N. J.
Northern Ohio Mfg. & Refg. Works, Cleveland, O.
Sargeant Mfg. Co., Newark, N. J.

Emery (See Platers' Supplies).

Emery Wheels (See Grinding Machinery, etc.)

Enameling Ovens.
Gehnrich, Herrmann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Engineers, Mechanical, Foundry, Etc.
Pangborn, Thomas W., Co., Jersey City, N. J.
Smith, J. D., Foundry Supply Co., Cleveland, O.

Escutcheon Pins, All Metals
Hassall, John, New York.

Etched Name Plates.
Schweizer, Max, Bridgeport, Conn.

Exhaust Fans.
Cleveland Blow Pipe & Mfg. Co., Cleveland, O.
Lederer, F. J., Co., Buffalo, N. Y.
Lelman Bros., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.

Expert Instruction—Plating, Coloring, Dipping, Etching, Etc.
Schweizer, Max, Bridgeport, Conn.

Extractors, Centrifugal Drying
American Tool & Machine Co., Boston, Mass.
Tolhurst Machine Works, Troy, N. Y.

Fig Cleanser.
Emery Candle Co., Cincinnati, O.
Haas Bros. Supply Co., Newark, N. J.
Harrai Chemical Co., New York.
International Chemical Co., Camden, N. J.

Fire Brick (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Stevens, Frederic B., Detroit, Mich.

Flasks, Brass Molders' (See also Foundry Supplies).
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.
Nicholls, W. H., New York.
Osborn Mfg. Co., Cleveland, O.
Sterling Wheelbarrow Co., West Allis, Wis.
Stevens, Frederic B., Detroit, Mich.

Fluxes, Metal (See also Foundry Supplies).
Reeves, Paul S., & Son, Philadelphia, Pa.
Uraniumite Co. of America, Buffalo, N. Y.

Fluxes, Soldering and Tinning
Grasselli Chemical Co., Cleveland, O.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.

Forgings, Automobile
American Manganese Bronze Co., New York.
Bliss, E. W., Co., Brooklyn, N. Y.
Phosphor Bronze Smelting Co., Philadelphia, Pa.

Foundry Facings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Dixon, Jos., Crucible Co., Jersey City, N. J.
Kelly, T. P., & Co., New York.
McKesson & Robbins, New York.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Foundry Supplies and Equipment.
Birkenstein, S., & Sons, Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Smith, J. D., Foundry Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Furnace Linings (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kroeschell Bros. Co., Chicago, Ill.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Annealing, Brazing, Etc.
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hartley, Spaickhaven & Fay, New York.
Monarch Eng. Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Furnaces, Electric
Bristol Co., The, Waterbury, Conn.

Furnaces, Galvanizing and Tinning
Farrel Foundry & Machine Co., Ansonia, Conn.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Furnaces, Melting, for Oil, Coal, Coke, or Gas. (See also Foundry Supplies).
Chicago Flexible Shaft Co., Chicago, Ill.
Detroit Foundry Supply Co., Detroit, Mich.
Fisher, Alfred, Chicago, Ill.
Hawley Down Draft Furnace Co., Chicago, Ill.
Ideal Furnace Co., Chester, Pa.
Kroeschell Bros. Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.
Stevens, Frederic B., Detroit, Mich.

Furnaces, Reverberatory
Rockwell Furnace Co., New York.
Rockwell, W. S., Co., New York.

Fusel Oil, Refined (See also Platers' Supplies).
Andersen Chemical Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.
Nikolas, G. J., & Co., Chicago, Ill.

Galvanized Specialties, Nails, Screws, Etc.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Plants and Equipment.
(See also Platers' and Polishers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing Barrels and Automatic Devices.
Globe Machine & Stamping Co., Cleveland, O.
Meaker Co., Chicago, Ill.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Galvanizing for the Trade.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Gas Producers and Power Plants
Wood, R. D., & Co., Philadelphia, Pa.

German Silver Ingots, Castings, Etc.
Buermann Mfg. Co., August, Newark, N. J.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Manufacturing Co., The, Seymour, Conn.

German Silver Sheets, Wire, Rods, Tubes, Etc.
Michigan Copper & Brass Co., Detroit, Mich.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Scovill Manufacturing Co., Waterbury, Conn.
Seymour Manufacturing Co., The, Seymour, Conn.
Waterbury Brass Co., Waterbury, Conn.

Gold Alloys.
Riverside Metal Co., Riverside, N. J.

Gold Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Graphite (See Foundry Supplies).

Grinding Machinery.
Bennett-O'Connell Co., Chicago, Ill.
Blake & Johnson Co., Waterbury, Conn.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Osborn Mfg. Co., Cleveland, O.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Grinding Wheels (See also Foundry Supplies).
Carborundum Co., Niagara Falls, N. Y.

Heat Gages.
Bristol Co., Waterbury, Conn.

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Hoists, Electric, Pneumatic, Hand
Detroit Foundry Supply Co., Detroit, Mich.

Hydraulic Accumulators.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Hydraulic Machinery, Presses, Jacks, Etc.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Iron, Scrap, Dealers in
Smith Co., The Morton B., New York.

Iron Tubes, Brass and Bronze Covered
Phenix Tube Co., Brooklyn, N. Y.

Japanning Ovens.
Gehnrich, Hermann, New York.
Rockwell Furnace Co., New York.
Steiner, E. E., Newark, N. J.

Japans.
Apothecaries Hall Co., Waterbury, Conn.

Jewelers' Equipment and Supplies (See also Platers' Supplies).
Leiman Bros., New York.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Tolhurst Machine Works, Troy, N. Y.

Jewelers' Findings.
Smith & Richardson, Attleboro, Mass.

Kettles, Galvanizing and Tinning (See also Platers' Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.

Lacquer Enamels. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Co., New York.
Egyptian Lacquer Mfg. Co., New York.
Eureka Pneumatic Spray Co., New York.
Hanson & Van Winkle Co., Newark, N. J.

Lacquering Ovens.
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Lacquer Sprayers.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Paasche Air Brush Co., Chicago, Ill.

Lacquers, Metal (See also Platers' Supplies).
American Lacquer Co., Bridgeport, Conn.
Anderson Chemical Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Celluloid Zapon Co., New York.
Chemical Products Co., Boston, Mass.
Egyptian Lacquer Manufacturing Co., New York.
Eureka Pneumatic Spray Co., New York.
General Bakelite Co., New York.
Hanson & Van Winkle Co., Newark, N. J.
Kalbfleisch, Franklin H., Co., New York.
Munning-Loeb Co., Matawan, N. J.
New Era Lustre Co., New Haven, Conn.
Nikolas, G. J., & Co., Chicago, Ill.

Ladle Heaters and Dryers (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Hawley Down Draft Furnace Co., Chicago, Ill.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Ladles (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.

Lathes, Polishing (See Platers' and Polishers' Supplies).

Lathes, Spinning, Turning, Etc.
American Tool & Machine Co., Boston, Mass.
Bliss, E. W., Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Pryibil, P., New York.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Lathes, Turret
American Tool & Machine Co., Boston, Mass.

Lead, Antimonial
Leavitt, C. W., & Co., New York.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead Castings, Antimonial
Electro Bronze Co., Arlington, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Lead, Pig and Bar
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Chadwick-Boston Lead Co., Boston, Mass.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Lead Pipe.
North American Smelting Co., Philadelphia, Pa.

Leather Meal for Dry Tumbling.
Peckham Mfg. Co., Newark, N. J.

Lubricants.
Dixon, Joseph, Crucible Co., Jersey City, N. J.

Lycopodium (See also Foundry Suplies).
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.

Magnesium Metal.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.
Roessler & Hasslacher Chemical Co., New York.

Magnetic Metal Separators (See also Foundry Supplies).
American Concentrator Co., Joplin, Mo.
Capitol Brass Works, Detroit, Mich.
Dings Electro-Mag. Separator Co., Milwaukee, Wis.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Mahogany Pattern Lumber.
Thompson & Co., Inc., Lewis, Philadelphia, Pa.

Manganese Bronze Ingots and Castings.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
American Manganese Bronze Co., New York.
Atkinson Co., The, Rochester, N. Y.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverside, N. J.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Bronze Sheets, Rods, Etc.
American Manganese Bronze Co., New York.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Manganese Copper.
American Smelting & Refining Co., Cincinnati, O.
Electric Semlting & Alum. Co., Lockport, N. Y.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Roessler & Hasslacher Chemical Co., New York.

Manganese Metal.
Leavitt, C. W., & Co., New York.
Reeves, Paul S., & Son, Philadelphia, Pa.
Roessler & Hasslacher Chemical Co., New York.

Match Plates
McPhee, Hugh, Tarrytown, N. Y.
Middleditch, Benj., Detroit, Mich.

Metals (See name of metal wanted).

Metal Cleaning Compounds (See also Platers' Supplies).
Anthony, H. M., & Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Emery Candle Co., Cincinnati, O.
Hanson & Van Winkle Co., Newark, N. J.
Harral Chemical Co., New York.
Haas Bros. Supply Co., Newark, N. J.
International Chemical Co., Camden, N. J.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.

Metal Fluxes (See also Foundry Supplies).
Reeves, Paul S., & Son, Philadelphia, Pa.
Uraniumite Co. of America, Buffalo, N. Y.

Metallurgists, Consulting.
Detroit Testing Laboratory, Detroit, Mich.
Krom, L. J., New York.
Ledoux & Co., New York.

Metals, Dealers in all Kinds of New (See also name of metal wanted).
Birkenstein, S., & Sons, Chicago, Ill.
Merchant & Evans Co., Philadelphia, Pa.
Moers, Albert A., New York.
Richards & Co., Boston, Mass.

Metals, Dealers in Old
Birkenstein, S., & Sons, Chicago, Ill.
Genesee Metal Co., Rochester, N. Y.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B. Co., New York.
Riverside Metal Co., Riverside, N. J.

Metals, Dealers in Old—Gold, Silver, Platinum
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Goods Drying Machines
Tolhurst Machine Works, Troy, N. Y.

Metal Goods Made to Order.
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Ansonia Brass & Copper Co., New York.
Bridgeport Brass Co., Bridgeport, Conn.
Buermann Mfg. Co., August, Newark, N. J.
Electro Bronze Co., Arlington, N. J.
Manhattan Brass Co., New York.
Riverside Metal Co., Riverside, N. J.
Sargeant Mfg. Co., Newark, N. J.
Scovil Manufacturing Co., Waterbury, Conn.
Waterbury Brass Co., Waterbury, Conn.

Metal, Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.
National Sheet Metal Co., Peru, Ill.

Metal Refiners, Gold and Silver.
Genesee Metal Co., Rochester, N. Y.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Metal Refiners—White Metal.
Birkenstein, S., & Sons, Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Reeves, Paul S., & Sons, Philadelphia, Pa.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal, Silver Plated Sheet
Benson, H. K. & F. S., Glen Ridge, N. J.

Metal Spinning. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal Stamping. (See also Metal Goods made to order).
Aluminum Goods Mfg. Co., Manitowoc, Wis.
Globe Machine & Stamping Co., Cleveland, O.
Riverside Metal Co., Riverside, N. J.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Metal Turnings, Drosses, Residue, Etc., Buyers of
Birkenstein, S., & Sons, Chicago, Ill.
Illinois Smelting & Refining Co., Chicago, Ill.
Smith, The Morton B., Co., New York.
Whipple & Choate, Bridgeport, Conn.
White & Bro., Inc., Philadelphia, Pa.

Mold Dryers, Portable (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Rockwell Furnace Co., New York.

Mold Spraying Machines. (See also Foundry Supplies).
Pangborn, Thomas W., Co., Jersey City, N. J.

Molds, Ingot (See also Foundry Supplies).
Farrel Foundry & Machine Co., Ansonia, Conn.
Nicholls, Wm. H., New York.
Paxson, J. W., Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Molding Machines. (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
McPhee, Hugh, Tarrytown, N. Y.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.
Turner Machine Co., Philadelphia, Pa.

Monel Metal Sheets.
Merchant & Evans Co., Philadelphia, Pa.

Muntz's Metal—Sheets, Rods, Bolts, Nails, Etc.
Taunton-New B'fd Copper Co., New Bedford, Mass.

Nails. (See name of metal wanted).

Name Plates, Etched
Schweizer, Max, Bridgeport, Conn.

Nickel.
Hanson & Van Winkle Co., Newark, N. J.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Nickel-Bronze Castings and Ingots.
Damascus Bronze Co., Pittsburgh, Pa.

Nickel Castings.
Hanson & Van Winkle Co., Newark, N. J.

Nickel Salts. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.
Hanson & Van Winkle Co., Newark, N. J.
McKesson & Robbins, New York.
Munning-Loeb Co., Matawan, N. J.
Stevens, Frederic B., Detroit, Mich.

Nickel, Shot
Merchant & Evans Co., Philadelphia, Pa.
Seymour Manufacturing Co., The, Seymour, Conn.

Nickel Silver Tubes.
Wells, A. H., & Co., Waterbury, Conn.

Oil Pumps and Storage Tanks.
Monarch Eng. & Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Oil Separators.
American Tool & Machine Co., Boston, Mass.

Oils, Tempering and Lubricating
Apothecaries Hall Co., Waterbury, Conn.
McKesson & Robbins, New York.
Swan & Finch, New York.

Ovens. (See also Core, Lacquering, Enameling and Sherardizing Ovens).
Gehnrich, Hermann, New York.
Steiner, E. E., Newark, N. J.

Parting Compounds. (See also Foundry Supplies)
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Stevens, Frederic B., Detroit, Mich.

Pattern Lumber, Mahogany.
Thompson & Co., Inc., Lewis, Philadelphia, Pa.

Patterns, Mounted
McPhee, Hugh, Tarrytown, N. Y.

Pattern Shop Supplies (See Foundry Supplies).

Pewter.
Standard Rolling Mills Inc., Brooklyn, N. Y.

Phosphor Bronze Ingots, Castings, Etc.
Ajax Metal Co., Philadelphia, Pa.
Allan, A., & Son, New York.
Atkinson Co., The, Rochester, N. Y.
Damascus Bronze Co., Pittsburgh, Pa.
Illinois Smelting & Refining Co., Chicago, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Bronze Sheets, Wire, Rods, Etc.
Phosphor Bronze Smelting Co., Philadelphia, Pa.
Pilling Brass Co., Waterbury, Conn.
Reeves, Paul S., & Son, Philadelphia, Pa.
Riverside Metal Co., Riverside, N. J.
Seymour Mfg. Co., Seymour, Conn.

Phosphor Copper and Phosphor Tin.
American Smelting & Refining Co., Cincinnati, O.
Atkinson Co., The, Rochester, N. Y.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Reeves, Paul S., & Son, Philadelphia, Pa.
Richards & Co., Boston, Mass.
Riverside Metal Co., Riverdale, N. J.
Roessler & Hasslacher Chemical Co., New York.

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General Chemical Co., Philadelphia, Pa.
McKesson & Robbins, New York.

Pickling Machines, Automatic
Torrington Manufacturing Co., Torrington, Conn.

Platers' Compound. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Haas Bros. Supply Co., Newark, N. J.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.
Swan & Finch Co., New York.

Platers' Metal (See also Platers' Supplies).
Kemp, W. H., Co., New York.
Pilling Brass Co., Waterbury, Conn.

Platers', Polishers' and Galvanizers' Equipment and Supplies.
Abbott Ball Co., Hartford, Conn.
Ames Sword Co., Chicopee, Mass.
Anderson Chemical Co., New York.
Anthony, H. M., Co., New York.
Apothecaries Hall Co., Waterbury, Conn.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Rogue, Chas. J., Electric Co., New York.
Burns, E. Reed, Brooklyn, N. Y.
Canning, W., & Co., Birmingham, England.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Emery Candle Co., Cincinnati, O.
Globe Machine & Stamping Co., Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
Haas Bros. Supply Co., Newark, N. J.
Hanson & Van Winkle Co., Newark, N. J.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
Leiman Bros., New York.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Meaker Company, Chicago, Ill.
McKesson & Robbins, New York.
Moyer, D. B., Walled Lake, Mich.
Munning-Loeb Co., Matawan, N. J.
Oliver, W. W., Mfg. Co.
Peckham Mfg. Co., Newark, N. J.
Platinum Metals Co., Brooklyn, N. Y.
Roessler & Hasslacher Chemical Co., New York.
Rockhill & Vietor, New York.
Roth Bros. Co., Chicago, Ill.
Smith & Richardson, Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Swan & Finch Co., New York.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Plating Barrels and Apparatus.
(See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
L'Hommedieu, C. F., & Sons Co., Chicago, Ill.
Klauder-Weldon Dy'g Mach. Co., Amsterdam, N. Y.
Munning-Loeb Co., Matawan, N. J.
Rockhill & Vietor, New York.
Smith & Richardson, Attleboro, Mass.
Stevens, Frederic B., Detroit, Mich.
Tolhurst Machine Works, Troy, N. Y.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Platinum Ingots.
Platinum Metals Co., Brooklyn, N. Y.

Platinum Salts and Solutions.
Platinum Metals Co., Brooklyn, N. Y.

Platinum Scrap, Buyers of
Platinum Metals Co., Brooklyn, N. Y.
Roessler & Hasslacher Co., New York.

Plumbago (See Graphite).

Polishing, Bulling and Burnishing Machinery and Appliances (See also Platers' Supplies).
Abbott Ball Co., Hartford, Conn.
Ames Sword Co., Chicopee, Mass.
Apothecaries Hall Co., Waterbury, Conn.
Backus & Leeser Co., New York.
Baird Machine Co., Oakville, Conn.
Bennett-O'Connell Co., Chicago, Ill.
Cleveland Blow Pipe Co., Cleveland, O.
Connecticut Dynamo & Motor Co., Irvington, N. J.
Detroit Foundry Supply Co., Detroit, Mich.
Divine Bros. Co., Utica, N. Y.
Globe Machine & Stamping Co., Cleveland, O.
Hanson & Van Winkle Co., Newark, N. J.
Knickerbocker Co., Jackson, Mich.
Leiman Bros., New York.
L'Hommedieu, C. F., & Sons, Chicago, Ill.
Middleditch, Benj., Detroit, Mich.
Moyer, D. B., Walled Lake, Mich.
Munning-Loeb Co., Matawan, N. J.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Osborn Mfg. Co., Cleveland, O.
Peckham Mfg. Co., Newark, N. J.
Pfleghar Hardware Sp'lty Co., New Haven, Conn.
Roth Bros., Chicago, Ill.
Stevens, Frederic B., Detroit, Mich.
Tolhurst Machine Works, Troy, N. Y.

Polishing Belts, Endless (See also Platers' Supplies).
Ames Sword Co., Chicopee, Mass.

Polishing Meal for Dry Tumbling
Peckham Mfg. Co., Newark, N. J.

Potash. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
International Chemical Co., Camden, N. J.
McKesson & Robbins, New York.
Niagara Alkali Co., Niagara Falls, N. Y.

Presses, Bench and Foot
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Company, Brooklyn, N. Y.
Leiman Bros., New York.
Shuster, The F. B., Co., New Haven, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Cabbaging
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Wood, R. D., & Co., Philadelphia, Pa.

Presses, Coining
Bliss, E. W., Co., Brooklyn, N. Y.
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Presses, Drop
Bliss, E. W., & Co., Brooklyn, N. Y.
Oliver, W. W., Mfg. Co., Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Presses, Filter.
American Tool & Machine Co., Boston, Mass.

Presses, Power
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
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Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Pressure Blowers (See also Foundry Supplies).
Eureka Pneumatic Spray Co., New York.
Lederer, F. J., Co., Buffalo, N. Y.
Leiman Bros., New York.
Monarch Eng. Mfg. Co., Baltimore, Md.
Rockwell Furnace Co., New York.

Pumice (See Platers', Polishers' and Galvanizers' Supplies).

Pyrometers.
Bristol & Co., The, Waterbury, Conn.

Riddles (See also Foundry Supplies).
Kelly, T. P., & Co., New York.
Stevens, Frederic B., Detroit, Mich.

Riveting Machines.
Shuster, The F. B., Co., New Haven, Conn.
Wood, R. D., & Co., Philadelphia, Pa.

Rivets—Brass, Aluminum, Etc.
Hassall, John, Inc., New York.
Hendricks Bros., New York.
Kemp, W. H., Co., New York.

Roll-Grinding Machines.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Chilled and Sand
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolls, Jewelers'
Leiman Bros., New York.
Oliver, W. W., Mfg. Co., The, Buffalo, N. Y.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rolling Mill Machinery.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Rouge. (See Platers' Supplies).

Rust-Proofing Process, (See also Galvanizing).
Flavell, E. A., New Britain, Conn.

Sand, Fire (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Machinery and Equipment.
Leiman Bros., New York.
Mott Automatic Sand Blast Mfg. Co., Chicago, Ill.
Nicholls, Wm. H., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Stevens, Frederic B., Detroit, Mich.

Sand Blast Systems
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Blast Tumbling Barrels.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sand Handling and Conveying Machines
Pangborn, Thomas W., Co., Jersey City, N. J.

Sand Dryers, Sifters and Mixers.
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Detroit Foundry Supply Co., Detroit, Mich.
Nicholls, Wm. H., New York.
Osborn Mfg. Co., Cleveland, O.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.
Turner Machine Co., Philadelphia, Pa.

Sand, Molding (See also Foundry Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Kelly, T. P., & Co., New York.
Pangborn, Thomas W., Co., Jersey City, N. J.
Paxson, J. W., Co., Philadelphia, Pa.

Sawdust, Boxwood, for Drying Purposes.
(See also Platers' Supplies).
Sommers, John, Faucet Co., Newark, N. J.

Sawdust Drying-out Boxes.
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Bennett-O'Connell Co., Chicago, Ill.
Hanson & Van Winkle Co., Newark, N. J.
Steiner, E. E., Newark, N. J.

Shears, Power
Bliss, E. W., Co., Brooklyn, N. Y.
Farrel Foundry & Machine Co., Ansonia, Conn.
Garrison, A., Fdy. & Machine Co., Pittsburg, Pa.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.
Watson-Stillman Co., New York.
Wood, R. D., & Co., Philadelphia, Pa.

Sheet Metal Straightening, Cutting and Forming Machinery.
Baird Machine Co., Oakville, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Shuster, The F. B., Co., New Haven, Conn.
Torrington Manufacturing Co., Torrington, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Sherardizing (See also Galvanizing).
Globe Machine & Stamping Co., Cleveland, O.

Sheradizing Ovens
Gehnrich, Hermann, New York.
Globe Machine & Stamping Co., Cleveland, O.
Rockwell Furnace Co., New York.

Silicon
American Smelting & Refining Co., Cincinnati, O.
Leavitt, C. W., & Co., New York.

Silicon Copper.
American Smelting & Refining Co., Cincinnati, O.
Damascus Bronze Co., Pittsburgh, Pa.
Electric Smelting & Alum'n Co., Lockport, N. Y.
Roessler & Hasslacher Chemical Co., New York.

Silver, Nitrate and Chloride of
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Jackson, John J., Co., Newark, N. J.

Silver Ingots, Bars, Plates, Etc.
Renziehausen, Wm. F., Co., Newark, N. J.

Silver, Rolled Sterling
Jackson, John J., Co., Newark, N. J.
Renziehausen, Wm. F., Co., Newark, N. J.
Riverside Metal Co., Riverside, N. J.

Silver Wire.
Jackson, John J., Co., Newark, N. J.

Smelters, Sweep
Renziehausen, Wm. F., Co., Newark, N. J.

Soap. (See also Platers' Supplies).
Apothecaries Hall Co., Waterbury, Conn.
Emery Candle Co., Cincinnati, O.
Haas Bros. Supply Co., Newark, N. J.
Harral Chemical Co., New York.
International Chemical Co., Camden, N. J.

Solder, Aluminum
Aluminum Company of America, Pittsburg, Pa.
Aluminum Solder Co., Boston, Mass.
Atkinson Co., The, Rochester, N. Y.
Electric Smelt. & Aluminum Co., Lockport, N. Y.
Janney, Steinmetz & Co., Philadelphia, Pa.
Kemp, W. H., Co., New York.
Richards & Co., Boston, Mass.
U. S. Reduction Co., Chicago, Ill.

Solder, Brazing
American Smelting & Refining Co., Cincinnati, O.
Hussey, C. G., & Co., Pittsburg, Pa.
Linton & Co., Providence, R. I.
Merchant & Evans Co., Philadelphia, Pa.
Naulty Smelting & Ref'g Co., Philadelphia, Pa.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Solder, Gold
Linton & Co., Providence, R. I.

Solder, Silver
Jackson, John J., & Co., Newark, N. J.
Linton & Co., Providence, R. I.

Solder, Tinners'
American Smelting & Refining Co., Cincinnati.
Merchant & Evans Co., Philadelphia, Pa.
Michigan Smelting & Refining Co., Detroit, Mich.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.

Soluble Cotton.
Anderson Chemical Co., New York.

Spelter.
American Smelting & Refining Co., Cincinnati, O.
Birkenstein, S., & Sons, Chicago, Ill.
Damascus Bronze Co., Pittsburgh, Pa.
Grasselli Chemical Co., Cleveland, O.
Hegeler Bros., Danville, Ill.
Hendricks Bros., New York.
Illinois Smelting & Refining Co., Chicago, Ill.
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Leavitt, C. W., & Co., New York.
Matthiessen & Hegeler Zinc Co., La Salle, Ill.
Michigan Smelting & Refining Co., Detroit, Mich.
New Jersey Zinc Co., The, New York.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., Chicago, Ill.
U. S. Reduction Co., Chicago, Ill.

Spinning Lathes.
Bliss, E. W., Company, Brooklyn, N. Y.
Pryibil, P., New York.

Spraying Machines.
Eclipse Air Brush & Compressor Co., Bloomfield, N. J.
Eureka Pneumatic Spray Co., New York.

Lederer, F. J., Co., Buffalo, N. Y.
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Pangborn, Thomas W., Co., Jersey City, N. J.

Sprue Cutters. (See also Foundry Supplies).
Bliss, E. W., Company, Brooklyn, N. Y.
Middleditch, Benj., Detroit, Mich.
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Smith, J. D., Foundry Supply Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.
Turner Machine Co., Philadelphia, Pa.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Stearic Acid and Stearine.
Emery Candle Co., Cincinnati, O.
Rockhill & Vietor, New York.

Tacks, (See name of metal wanted).

Tanks, Electroplaters' (See also Platers' Supplies).
Chadwick-Boston Lead Co., Boston, Mass.
Corcoran, A. J., Inc., New York.
Hanson & Van Winkle Co., Newark, N. J.
Stearns, The A. T., Lumber Co., Boston, Mass.

Tin, Chloride of
Grasselli Chemical Co., Cleveland, O.

Tinning Machines
Globe Machine & Stamping Co., Cleveland, O.
U. S. Electro Galvanizing Co., Brooklyn, N. Y.

Tin, Pig, Bar and Block
American Smelting & Refining Co., Cincinnati, O
Birkenstein, S., & Sons, Chicago, Ill.
Hendricks Bros., New York.
Leavitt, C. W., & Co., New York.
Merchant & Evans Co., Boston, Mass.
Michigan Smelting & Refining Co., Detroit, Mich.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.
U. S. Reduction Co., Chicago, Ill.

Tin, Sheet Block
Merchant & Evans Co., Philadelphia, Pa.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Tramrails. (See also Foundry Supplies).
Rockwell Furnace Co., New York.

Tripoli Flour, Stone, Filters, Etc. (See also Platers' Supplies).
American Tripoli Co., Seneca, Mo.
Apothecaries Hall Co., Waterbury, Conn.
Detroit Foundry Supply Co., Detroit, Mich.
McKesson & Robbins, New York.
Stevens, Frederic B., Detroit, Mich.

Trolley Systems.
Nicholls, Wm. H., New York.
Rockwell Furnace Co., New York.

Tumbling Barrels, Leather for Dry.
Peckham Mfg. Co., Newark, N. J.

Tubes. (See name of metal wanted).

Tumbling Barrels. (See also Foundry Supplies and Platers' Supplies).
Detroit Foundry Supply Co., Detroit, Mich.
Globe Machine & Stamping Co., Cleveland, O.
Middleditch, Benj., Detroit, Mich.
Nicholls, Wm. H., New York.
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Type Metal.
American Smelting & Refining Co., Cincinnati, O.
Illinois Smelting & Refining Co., Chicago, Ill.
North American Smelting Co., Philadelphia, Pa.
Richards & Co., Boston, Mass.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

Uraniumite
Uraniumite Co. of America, Buffalo, N. Y.

Vibrators. (See also Foundry Supplies).
Nicholls, Wm. H., New York.

Vienna Lime (See Platers', Polishers' and Galvanizers' Supplies).

Waste Washing Machines.
American Tool & Machine Co., Boston, Mass.

Wax Wire. (See also Foundry Supplies).
Stevens, Frederic B., Detroit, Mich.

Welding and Tempering Compounds
Uraniumite Co. of America, Buffalo, N. Y.

White Metal Castings.
Electro Bronze Co., Arlington, N. J.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

White Metal Rolling for the Trade.
Standard Rolling Mills, Inc., Brooklyn, N. Y.

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Wire Goods Manufacturers.
Baird Machine Co., Oakville, Conn.
Campbell-Warner Co., Middletown, Conn.

Wire Mill Equipment.
Blake & Johnson Co., Waterbury, Conn.
Farrel Foundry & Machine Co., Ansonia, Conn.
Waterbury (Conn.) Farrel Foundry & Machine Co.

Wire Nails, All Metals.
John Hassall, Inc., New York.

Wire Straightening and Forming Machinery
Baird Machine Co., Oakville, Conn.
Blake & Johnson Co., Waterbury, Conn.
Bliss, E. W., Co., Brooklyn, N. Y.
Pangborn, Thomas W., Co., Jersey City, N. J.
Shuster, The F. B., Co., New Haven, Conn.

Wire Wheel and Hand Brushes. (See also Foundry Supplies).
Blumenthal, Hermann, & Co., New York.
Manufacturers' Brush Co., Cleveland, O.
Osborn Mfg. Co., Cleveland, O.
Paxson, J. W., Co., Philadelphia, Pa.
Riehl Manufacturing Co., Cleveland, O.
Stevens, Frederic B., Detroit, Mich.

Zinc Battery Plates.
Grasselli Chemical Co., Cleveland, O.
Matthieson & Hegeler Zinc Co., La Salle, Ill.

Zinc, Chloride of (See also Platers' Supplies)..
Grasselli Chemical Co., Cleveland, O.
Richards & Co., Boston, Mass.
Sandoval Zinc Co., East St. Louis, Ill.

Zinc Dust (See also Platers' Supplies).
Globe Machine & Stamping Co., Cleveland, O.
Grasselli Chemical Co., Cleveland, O.
Leavitt, C. W., & Co., New York.
McKesson & Robbins, New York.

Zinc Salts, Commercial (See also Platers' Supplies).
Sandoval Zinc Co., East St. Louis, Ill.

Zinc Sheet and Plate.
Illinois Zinc Co., Peru, Ill.
Matthiesen & Hegeler Zinc Co., La Salle, Ill.
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